APPENDIX H - Part 1

Stakeholder outreach and comment information.

From: Doug Leeper
To: "lbeever@chnep.org"; "beever@ci.punta-gorda.fl.us"
Subject: FW: Update on lower Peace River MFLs reevaluation
Date: Wednesday, September 24, 2014 12:59:00 PM

From: Doug Leeper
Sent: Wednesday, September 24, 2014 12:57 PM
To: Beever, Lisa (lbeever@swfrpc.org)
Cc: Veronica Craw; Mike Heyl; Xinjian Chen; Ed Call; Yonas Ghile
Subject: Update on lower Peace River MFLs reevaluation

Dr. Beever,

I'm writing to provide you with an update on the District's reevaluation of minimum flows that have been adopted for the lower Peace River. I and additional colleagues here at the District will be assuming the work that Sid Flannery, who recently retired from the District, initiated to support the reevaluation process.

The current minimum flows for the lower Peace River were adopted into District rules in July 2010 and became effective in August 2010. The rule language associated with the minimum flows requires that they will be reevaluated to incorporate additional ecological data for the lower Peace River within five years of adoption of the rule. Five years from the date of adoption will be in July 2015. In keeping with this target, a number of District-funded technical projects have been completed, including a re-mapping of the bathymetry of the upper Charlotte Harbor and the tidal reaches of the Myakka and Peace rivers, and an assessment of relationships between flow in the Peace River and chlorophyll *a* concentrations in the estuary that was completed by Dr. Ralph Montgomery of Atkins, North America. Mote Marine Laboratory has installed and maintained a data collection tower in the upper harbor to support recalibration of the District's hydrodynamic model of Charlotte Harbor and the tidal reaches of the lower Peace and Myakka rivers. In addition, the District has contracted with the University of South Florida (USF) College of Marine Science to run their West Florida Shelf model to generate boundary salinity, temperature, and water level boundary conditions during January 2013 through August 2014 at the open boundaries of the District hydrodynamic model that extend into the Gulf of Mexico.

These completed and ongoing projects have used nearly all the funds the District has had available for reevaluation of the minimum flows through our current fiscal year. In addition, compiling results from the various projects with sufficient time for completion of a reevaluation of the minimum flows in 2015 2015 is expected to be extremely difficult and unlikely. District technical staff is, therefore, currently recommending that the reevaluation of minimum flows for the lower Peace River be rescheduled for completion in 2018. This scheduling change and those associated with establishment of minimum flows and levels for other priority water bodies will be presented to the District Governing Board in late September. Following an October 1, 2014 public workshop on the updated minimum flows and levels priority list and schedule, staff anticipates returning to the Governing Board at the end of October to seek Board approval of an updated list/schedule that will be submitted to the Department of Environmental Protection in November for final approval.

Importantly, staff believes that rescheduling the completion of the lower Peace River minimum flows reevaluation will allow for incorporation of new, informative physical and ecological information that will strengthen the assessment. Described below are three new efforts that have been budgeted and that we want to incorporate into the reevaluation process.

Recent findings from the Florida Fish and Wildlife Research Institute (FWRI) indicate that snook utilize floodplain habitats in the tidal freshwater zone of the Peace River above the Highway 761 bridge, approximately 30 to 49 kilometers upstream of the river mouth. These findings indicate that snook abundance and condition benefit from high flows in Peace River that inundate the river floodplain and increase food resource availability. Based on this information, the District is conducting new ground surveys and collecting high-resolution LiDAR data for this portion of the Peace River floodplain. We plan to incorporate this topographical information into the District's hydrodynamic model of the lower Peace River to simulate changes in floodplain inundation that may occur as a result of changes in river flows.

The District has also had extensive discussions with Dr. Peter Rubec of the FWRI regarding a habitat suitability modeling project for estuarine dependent species in the lower Peace River and Charlotte Harbor. For the planned project, Dr. Rubec will update his previously developed model with the newly available bathymetry for the system and recent seagrass coverage, and will also update the fisheries-independent catch data that are used as model input. The updated model will be utilized to evaluate six species – life stages that are known to be responsive to freshwater inflow. The distribution and abundance of these species-life stages will be simulated for baseline flows (no withdrawals) and flows with the percent-of-flow reductions corresponding to the proposed minimum flows applied. This project will serve as an important check to ensure that any minimum flows that the District proposes do not cause unacceptable changes to fish populations within the lower Peace River. If necessary, any proposed minimum flows could be revised to avoid potentially unacceptable changes.

The District is also planning to have the USF College of Marine Science extend the years of boundary conditions that can be used for the District's hydrodynamic model of the harbor and rivers. Boundary conditions for the years 2007 through 2012 will be developed so the District can simulate changes during a 7.5-year period that incorporates a wide range of freshwater flow conditions.

It will likely take two years to complete the projects and work efforts planned for reevaluation of the lower Peace River minimum flows. Therefore, staff believes the technical basis supporting the reevaluation effort will be strengthened by rescheduling completion of the reevaluation for 2018. We are confident that this rescheduling will allow for completion of the planned work efforts and also allow time for presentation of study results to all stakeholders prior to the development of any recommendations concerning potential changes to the adopted minimum flows. Staff does not believe the ecological integrity of the lower Peace River will be in any way jeopardized by the proposed rescheduling of completion of the minimum flows reevaluation.

I hope you understand the District's reasons for the proposed rescheduling of the lower Peace River minimum flows reevaluation. Please feel free to contact me if you have any questions regarding this matter. I look forward to working with you and the Charlotte Harbor National Estuary Program on important environmental issues in the region.

Sincerely,

Douglas A. Leeper
Chief Advisory Environmental Scientist
Water Resources Bureau
Southwest Florida Water Management District
2379 Broad Street
Brooksville, Florida 34604-6899
1-800-423-1476, ext. 4272 (FL only)
352-796-7211, ext. 4272
352-754-6885 (Fax)
doug.leeper@watermatters.org

From:	Lisa Beever
To:	Doug Leeper
Cc:	Judy Ott; Liz Donley; Maran Hilgendorf
Subject:	FW: Update on lower Peace River MFLs reevaluation
Date:	Tuesday, September 30, 2014 1:09:39 PM

Hi Doug!

Thank you for the outline of projects initiated to assist with the re-evaluation of the Lower Peace River MFL. The re-evaluation of the MFL will benefit by these additional products. I am particularly pleased about the contract with USF to develop boundary conditions of the West Florida Shelf for the hydrodynamic model. I hope that the normal graphics USF uses to illustrate model findings will be utilized and presented to our Management Conference when they are available.

Please contact me when presentations may be made to our committees related to the hydrodynamic model. Thank you,

Lisa B. Beever, PhD, AICP, Director
Charlotte Harbor National Estuary Program (CHNEP)
326 West Marion Ave, Punta Gorda FL 33950
941-575-3392
Toll-free 866-835-5785
www.CHNEP.org

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-----Original Message-----
From: Lisa Beever [mailto:lbeever@swfrpc.org]
Sent: Monday, September 29, 2014 1:59 PM
To: Lisa Beever
Subject: FW: Update on lower Peace River MFLs reevaluation

From: Doug Leeper [Doug.Leeper@swfwmd.state.fl.us]
Sent: Wednesday, September 24, 2014 12:59 PM
To: Lisa Beever; beever@ci.punta-gorda.fl.us
Subject: FW: Update on lower Peace River MFLs reevaluation

From: Doug Leeper
Sent: Wednesday, September 24, 2014 12:57 PM
To: Beever, Lisa (lbeever@swfrpc.org)
Cc: Veronica Craw; Mike Heyl; Xinjian Chen; Ed Call; Yonas Ghile
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Sincerely,

Douglas A. Leeper
Chief Advisory Environmental Scientist
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doug.leeper@watermatters.org<mailto:doug.leeper@watermatters.org>

From:	Doug Leeper
To:	"Allen, Deedra M - FishHawk"
Cc:	Gabe I. Herrick; Yonas Ghile; Jennette Seachrist; Eric DeHaven
Subject:	RE: MFL Meeting 08/30
Date:	Tuesday, August 29, 2017 2:33:00 PM
Attachments:	SWFWMD 2015-09 Gov Bd - Lower Peace River Inititial Reevaluation.pdf SWFWMD 2015-Intial reevaluation of the MFLs for the LPR.pdf

Deedra:

We haven't yet prepared a report for the planned 2018 reevaluation of minimum flows established for the lower Peace River. When completed, the draft report, peer review information, and eventually, a final report concerning recommended minimum flows for the river segment (and for the lower segment of Shell Creek) will be presented to the District Governing Board. All Governing Board meetings are open to the public and include opportunities for stakeholder input.

In addition to the presentations made to the District Governing Board, we will be facilitating a publicly-noticed peer review process for our minimum flow reevaluation work. The peer review will be held in accordance with the state "government-in-the-sunshine law" and include opportunities for public comment. We also plan to host a publicly-noticed meeting on findings from our reevaluation of the minimum flows for the lower Peace River and development of minimum flows for lower Shell Creek. As requested, we will also meet with and discuss the proposed minimum flows with individual stakeholders.

In support of our ongoing reevaluation of the lower Peace River minimum flows, we did complete an initial reevaluation in 2015. A recap file from the September 2015 District Governing Board meeting that discusses the initial reevaluation and a copy of the initial reevaluation report are attached.

Doug Leeper
MFLs Program Lead
Natural Systems and Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34609
1-800-423-1476, ext. 4272
352-796-7211, ext. 4272
doug.leeper@watermatters.org

From: Allen, Deedra M - FishHawk [mailto:Deedra.Allen@mosaicco.com]
Sent: Tuesday, August 29, 2017 1:36 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Cc: Gabe I. Herrick <Gabe.Herrick@swfwmd.state.fl.us>
Subject: RE: MFL Meeting 08/30

Doug
I note that the Peace River (lower segment) appears to be scheduled for re-evaluation in 2018.

Can you tell me how that will be done, e.g., are there reports available for public review, will there be meetings on it?
Thanks
Dee

Deedra (Dee) Allen, P.E., J.D. | Director – Regulatory Affairs
The Mosaic Company | 13830 Circa Crossing Dr | Lithia, FL 33547
Office: 813.500.6914 | Cell: 863.860.1038 | deedra.allen@mosaicco.com

From: Doug Leeper [mailto:Doug.Leeper@swfwmd.state.fl.us]
Sent: Tuesday, August 29, 2017 8:26 AM
To: Allen, Deedra M - FishHawk <Deedra.Allen@mosaicco.com>
Cc: Gabe I. Herrick <Gabe.Herrick@swfwmd.state.fl.us>
Subject: RE: MFL Meeting 08/30

CAUTION: External Email.

Ms. Allen:

The information you've requested is included in the attached District Governing Board meeting agenda item.

Let me know if you have any comments or questions.

Doug Leeper
MFLs Program Lead
Natural Systems and Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34609
1-800-423-1476, ext. 4272
352-796-7211, ext. 4272
doug.leeper@watermatters.org

From: Allen, Deedra M - FishHawk [mailto:Deedra.Allen@mosaicco.com]
Sent: Monday, August 28, 2017 1:55 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>; douglas.leeper@swfwmd.state.fl.us
Subject: MFL Meeting 08/30

I see the agenda for the meeting on Wednesday 08/30, but don't see any documents attached to it. Is there some information on what water bodies are proposed to be on the priority list that you can share before the meeting?
Thanks
Dee

Deedra (Dee) Allen, P.E., J.D. | Director – Regulatory Affairs
The Mosaic Company | 13830 Circa Crossing Dr | Lithia, FL 33547
Office: 813.500.6914 | Cell: 863.860.1038 | deedra.allen@mosaicco.com

RESOURCE MANAGEMENT COMMITTEE

September 29, 2015

Submit and File Report

Initial Reevaluation of the MFLs for Lower Peace River (B081)

Purpose
To provide an overview of progress made to date and ongoing activities to support the reevaluation of the Minimum Flow and Levels (MFLs) for the Lower Peace River.

Background/History
Work on the development of MFLs for the Lower Peace River (LPR) was initiated in 2007, and was based on goals that included maintaining freshwater at the Peace River Manasota Regional Water Supply Authority (PRMRWSA) withdrawal plant on the LPR and biologically-relevant salinities throughout the LPR. The MFLs for the LPR were adopted in July 2010 and became effective in August 2010 (Rule 40D-8.041(8), F.A.C.). The MFLs were adopted to ensure that the minimum hydrologic requirements of the water resources or ecology of the natural systems associated with the estuarine reach of the LPR are met. The MFLs include a low flow threshold that is applicable throughout the year and seasonally dependent (i.e., block-specific) minimum flows that specify allowable reductions in the sum of flows at three gage sites that would occur in the absence of upstream withdrawals.

The adopted rule requires the reevaluation of the MFLs within five years of the adoption date to incorporate additional ecological data. Five years from the date of adoption is in July 2015 and in keeping with this timeline, staff has completed an initial reevaluation and scheduled completion of a more comprehensive reevaluation for 2018.

Purpose/Approach
As part of the initial MFLs reevaluation, the reassessment of anthropogenic impacts on Peace River flows and the reconstruction of an unimpaired flow record for the LPR, i.e., a flow record that has been modified to remove effects associated with water withdrawals, were completed. To support this effort, flow data were updated through 2013. Flow variation associated with warming and cooling of the Atlantic Multi-decadal Oscillation (AMO) and El Niño Southern Oscillation (ENSO) were also investigated. To gain a better understanding of the factors that control the Peace River flows and simulate the effects of climate, groundwater withdrawals, and land use change, District findings from the Peace River Integrated Model project were also evaluated. Collectively, these data were used to reconstruct an unimpaired flow regime for LPR. Additionally, extensive physical, chemical, and biological data were analyzed for both pre- and post- MFL's adoption periods.

Results
One objective of the initial reevaluation was to evaluate compliance of PRMWRSA withdrawals with permit conditions associated with the MFLs rule and assess the PRMRWSA withdrawals with regard to the prevention of significant environmental changes to the LPR/upper Charlotte Harbor estuarine system. The District analysis shows that the PRMRWSA has been in compliance with their permit conditions.

In total, the analyses completed for this initial MFLs reevaluation indicate that the current withdrawals schedule included in the water use permit issued to the PRMRWSA has not and is not expected to significantly harm the physical, chemical or biological characteristics of the LPR/Charlotte Harbor estuarine system.

A summary of several District projects that have been conducted or are planned to further strengthen reevaluation of the LPR MFLs is also included in the initial reevaluation report. Completed projects include the estimation of flows from ungaged portions of the Peace/Myakka Rivers, re-mapping of the bathymetry of the LPR/Upper Charlotte Harbor estuarine system, production of a LiDAR-based high resolution digital elevation model for the Peace River, installation of a data collection tower in the upper Charlotte Harbor, refinement of a hydrodynamic model for the LPR/Charlotte Harbor estuarine system, and assessment or relationships between flow and chlorophyll concentrations in the LPR estuary. An effort currently underway involves development of habitat suitability modeling for evaluating the abundance and distribution of six fish species that are known to be responsive to freshwater inflows. The District is also planning for a project to characterize floodplain features/habitats and evaluate how these habitats may be affected by changes in river flows.

Once the additional studies are complete, their results will be compiled and analyzed for inclusion in the comprehensive Peace River MFLs reevaluation scheduled for 2018.

Copies of the report titled “Initial Reevaluation of the Minimum Flows and Levels for the Lower Peace River” are available upon request.

Staff Recommendation:

This item is submitted for the Governing Boards information, and no action is required.

Presenter: Yonas Ghile, Senior Environmental Scientist, Springs and Environmental Flows,

Natuarl Systems and Restoration Bureau

MINUTES OF THE MEETING

GOVERNING BOARD
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

TAMPA, FLORIDA SEPTEMBER 29, 2015

The Governing Board of the Southwest Florida Water Management District (District) met for its regular meeting at 9:00 a.m. on September 29, 2015, at the District's Tampa Service Office. The following persons were present:

Board Members Present
Michael A. Babb, Chair
Randall S. Maggard, Vice Chair
Jeff Adams, Secretary
David W. Dunbar, Treasurer
H. Paul Senft, Member
Carlos Beruff, Member
George Mann, Member
Wendy Griffin, Member
Bryan Beswick, Member
Michael A. Moran, Member
Ed Armstrong, Member

Board Members Absent
Tommy Bronson, Member

Staff Members
Robert R. Beltran, Executive Director
Brian Armstrong, Assistant Executive Director
David T. Rathke, Chief of Staff
Karen West, General Counsel
Kurt Fritsch, Inspector General
John J. Campbell, Division Director
Ken Frink, Division Director
Mark A. Hammond, Division Director
Alba E. Más, Division Director

Board's Administrative Support
Cara Martin, Board & Executive Services Manager
Lori Manuel, Administrative Assistant

A list of others present who signed the attendance roster is filed in the permanent records of the District. This meeting was available for viewing through Internet streaming. Approved minutes from previous meetings can be found on the District's Web site (www.WaterMatters.org).

PUBLIC HEARING (Audio – 00:00)

1. **Call to Order**
Chair Michael Babb called the meeting to order and opened the public hearing. Secretary Adams stated a quorum was present.

2. **Invocation and Pledge of Allegiance**
Board Member Adams offered the invocation. Chair Babb led the Pledge of Allegiance to the Flag of the United States of America.

Chair Babb introduced each member of the Governing Board. He noted that the Board meeting was recorded for broadcast on government access channels, and public input was only taken during the meeting onsite.

Chair Babb stated that anyone wishing to address the Governing Board concerning any item listed on the agenda or any item that does not appear on the agenda should fill out and submit a speaker's card. To assure that all participants have an opportunity to speak, a member of the public may submit a speaker's card to comment on agenda items only during today's meeting. If the speaker wishes to address the Board on an issue not on today's agenda, a speaker's card may be submitted for comment during "Public Input." Chair Babb stated that comments would be limited to three minutes per speaker, and, when appropriate, exceptions to the three-minute limit may be granted by the chair. He also requested that several individuals wishing to speak on the same issue/topic designate a spokesperson.

3. **Additions/Deletions to Agenda**
Section 120.525, Florida Statutes, allows the District to change the published agenda for good cause shown, as determined by the presiding officer.

Mr. Beltran, Executive Director, added following item for discussion to the agenda:

Resource Management Committee
58. Sarasota Bay Estuary Program Funding

Chair Babb said there is good cause to amend the published agenda as allowed by Section 120.525, Florida Statutes. A motion was made to approve the amendments to the published agenda, as amended, which was seconded. The motion carried unanimously. (Audio 00:03:59)

4. **Public Input for Issues Not Listed on the Published Agenda**
Chair Babb noted at this time, the public is given an opportunity to comment on any topic not listed on the agenda. There were no *Request to Speak* cards submitted.

CONSENT AGENDA
Chair Babb asked that before the Board considers action on the Consent Agenda whether there is anyone in the audience who wishes to address the Board regarding an item listed on the Consent Agenda.

Chair Babb stated he received no *Request to Speak* cards for any agenda items.

Regulation Committee
5. **Individual Water Use Permits Referred to the Governing Board**
   a. **WUP No. 20012782.001 - Standard Sand & Silica Company / Davenport Location (Polk County)**

   Staff recommended the Board approve the proposed permit.

Operations, Lands and Resource Monitoring Committee
6. **FY2014-15 Board Designated Encumbrance**
Staff recommended the Board approve encumbrance of FY2014-15 funds in an amount of $200,000 for the Lower Hillsborough River Strategy Pump Station S-162 (H405), for work to be completed in FY2016.

Resource Management Committee
7. **Flatford Swamp Hydrologic/Adaptive Management Restoration (H089) Approve Sale of Surplus Lands – Panasoffkee/Outlet Tract, SWF Parcel No. 19-441-110S**
Staff recommended the Board approve the scope revision to include investigation of the aquifer injection option into the project budget which is Board encumbered.

8. **Pasco County Reclaimed Water Treatment Wetland & Aquifer Recharge Project - Site 1 (N666)**
Staff recommended the Board approve the County's request to move forward with final design and permitting of the Pasco County Reclaimed Water Treatment Wetland & Aquifer Recharge Facility (N666), and direct staff to enter into an agreement for fifty percent of the total project cost identified in the 30 percent design ($14,300,966), allowing reimbursement of the District's share for the design, permitting, and construction of this facility.

9. **Scope Change for Citrus County Sugarmill Woods Advanced Wastewater Treatment Project (WC02)**
Staff recommended the Board approve the change in scope to reduce project capacity from 2.0 mgd to 1.5 mgd; change treatment to conventional nutrient reduction methods only; and utilize FDEP funding for construction costs only.

10. **Five-Year Water Resource Development Work Plan (P872)**
Staff recommended the Board authorize staff to submit the proposed Five-Year Water Resource Development Work Program to the Florida Department of Environmental Protection for review.

Finance/Outreach & Planning Committee

11. **Revise Board Policy 130-9, Fund Balance**
Staff recommended the Board revise Board Policy 130-9, Fund Balance.

12. **Revise Board Policy 190-1, Records Management**
Staff recommended the Board approve the policy changes as presented in the exhibits to this item.

13. **Adopt Resolution Committing Fund Balance for an Economic Stabilization Fund and Long-Term Projects Reserve in Compliance with Board Policy 130-9**
Staff recommended the Board adopt Resolution No. 15-17 - *Committing Fund Balance for an Economic Stabilization Fund and Long-Term Projects Reserve in Compliance with Board Policy 130-9*; Rescind Resolution 11-15, *Committing Fund Balance in Compliance with Board Policy 130-9*; and Rescind Resolution 12-04, *Committing Fund Balance for an Economic Stabilization Fund in Compliance with Board Policy 130-9*.

14. **Approval of Agreement for Use of Property Tax Collections to Fund Exemption Audit Services Among Pinellas County Property Appraiser, Pinellas County Tax Collector and Southwest Florida Water Management District**
Staff recommended the Board approve the Agreement for Use of Property Tax Collections to Fund Exemption Audit Services among Pinellas County Property Appraiser, Pinellas County Tax Collector and Southwest Florida Water Management District.

15. **Fiscal Year (FY) 2014-15 Board Designated Encumbrance Request**
Staff recommended the Board approve the encumbrance of $1 million to roll into FY2015-16 for potential staff merit increases and/or performance incentives in accordance with Board Policy 710-3.

16. **Board Encumbrance to the Computer Renewal and Replacement Sinking Fund**
Staff recommended the Board encumber $35,000 of funds budgeted in FY2015 to procure computer hardware and software via the Computer Renewal and Replacement Sinking Fund reserve account.

17. **Budget Transfer - Duck Lake Watershed Management Plan (L737)**
Staff recommended the Governing Board transfer $119,700 previously budgeted for the Withlacoochee River Watershed Initiative project to the Duck Lake Watershed Management Plan project to replace the Hillsborough River Basin funds.

18. **Budget Transfer Report**
Staff recommended the Board approve the Budget Transfer Report covering all budget transfers for August 2015.

General Counsel's Report

19. Administrative, Enforcement and Litigation Activities that Require Governing Board Approval

a. **Initiation of Litigation – Violation of Consent Order and Practicing Water Well Contracting with a Suspended License – David N. Howard – License No. 9354 – Hillsborough County**
Staff recommended the Board authorize the initiation of litigation against David N. Howard, and any other appropriate parties, to obtain compliance with Consent Order SWF 15-012, to recover an administrative fine/civil penalty for any violations, and to recover District enforcement costs, court costs and attorney fees.

b. **Interagency Agreement Between the Southwest Florida Water Management District and the South Florida Water Management District -- Designation of Regulatory Responsibility for a Water Use Permit – Grove No. 91 – Polk County**
Staff recommended the Board approve the Interagency Agreement between the Southwest Florida Water Management District and the South Florida Water Management District for Designation of Regulatory Responsibility for a Water Use Permit for C & T Groves & Lands, Inc., in Polk County.

c. **Approve the District's Annual Regulatory Plan**
Staff recommended the Board:
- Approve the District's Annual Regulatory Plan for 2015-2016; and
- Execute the certification required by 120.74(1)(d), F.S.

20. Rulemaking - None

Executive Director's Report

21. Approve Resolution No. 15-12, Commending Carlos Beruff for His Service as a Member of the Southwest Florida Water Management District Governing Board
Staff recommended the Board approve Resolution No. 15-12 as presented.

22. Approve Governing Board Meeting Minutes - August 25, 2015
Staff recommended the Board approve the minutes as presented.

A motion was made and seconded to approve the Consent Agenda as amended. Motion carried unanimously. (Audio 00:04:26)

Chair Babb relinquished the gavel to the Resource Management Committee Chair Senft who called the Committee meeting to order. (Audio – 00:04:36)

Resource Management Committee

Discussion

23. Consent Item(s) Moved for Discussion – None

24. Tampa Bay Water Update
Mr. Matt Jordan, General Manager for Tampa Bay Water (TBW), provided a presentation on the TBW update. This presentation included: history; counties and cities represented; mission; sources of water supply; water supply demands; desalination status; reservoir status; use of consolidated water use permit; long-term master water plan update; and water supply options beyond 2020.

Mr. Jordan stated that TBW is implementing an asset management program. This involved creating a formalized asset management list of infrastructures and information associated with them. This will assist TBW in evaluating the life of their infrastructures and consequence of any system failures. In addition, TBW implemented an International Standard for Organization (ISO) 14001 Environmental Management System. This is a continual improvement process to encourage positive stewardship of the environment "Plan, Do, Check and Act".

Mr. Jordan commended the communication that has occurred between the District and TBW.

Board Member Senft asked if TBW has funds allocated if an infrastructure needs replacement. Mr. Jordan responded in the affirmative.

Vice Chair Maggard asked for clarification regarding the ISO 14001 certification program. Mr. Jordan explained it is an international standard endorsed by the Environmental Protection Agency (EPA). He outlined some of the components associated with it. Discussion ensued.

This item was for information only.

25. <u>Central Florida Water Initiative Update</u>

Mr. Mark Hammond, Resource Management Director, clarified the staff recommendation on this item. He stated the approval of the Memorandum of Understanding will be requested at the November Governing Board meeting.

Mr. Hammond presented an overview of the Central Florida Water Initiative (CFWI) which included: history; guidance document principles; overview of regional water supply plan; challenges faced in the region; solution strategies overview; historic water use versus population; solutions projects and financial assessments; implementation strategy; and a plan schedule.

Mr. Hammond also provided an update on a Polk Regional Water Cooperative Formation Team kick-off meeting that occurred on September 18. This meeting involved Board Member George Mann, District staff, county commissioners and representatives of municipalities. This team will be forming a regional entity to review conservation, reuse and other alternative sources.

Ms. Colleen Thayer, Public Affairs Bureau Chief, provided a presentation on the CFWI outreach efforts. These efforts have focused on consensus building, facilitating discussions and enhancing communications related to CFWI among key stakeholders. She outlined the outreach efforts and key stakeholders and provided an overview of the CFWI web page (cfwiwater.com).

Ms. Alba Mas, Director of Regulation, provided an overview of the CFWI Regulatory Team. This included: team composition; objectives; interim steps; overview of the Memorandum of Understanding (MOU); general provisions and an MOU timeline.

Vice Chair Maggard asked if the Florida Department of Agriculture and Consumer Services (FDACS) and the Florida Department of Environmental Protection (FDEP) have signed the MOU. Mr. Hammond responded in the negative. Vice Chair Senft asked if funding has been discussed. Mr. Hammond responded the funding is not addressed in the MOU. Board Member Senft clarified it is anticipated this is will be a cooperative funded initiative. Discussion ensued.

Vice Chair Maggard asked if the District has addressed funding for this initiative. Mr. Hammond responded in the affirmative. Discussion ensued.

Treasurer Dunbar asked if there are distribution costs associated with projects. Mr. Hammond responded in the affirmative but explained that not all projects would be developed. He also added that some projects are environmental recovery, not potable water. He stated the costs indicated with the projects do include the transmission costs associated with them. Discussion ensued.

Treasurer Dunbar asked about water quantity that has been permitted versus what is demanded. Mr. Hammond responded that future needs will have to be met with alternative water resources. Discussion ensued.

This item was for information only.

58. Sarasota Bay Estuary Program Funding

Ms. Jennette Seachrist, Bureau Chief of the Natural System and Restoration Bureau, provided a presentation which included a history of the Sarasota Bay Estuary Program (SBEP); concerns and issues associated with management, finance and policy board direction; prior proposed solution/action; overview of inter-local agreement; and results of an audit. Discussion ensued.

Board Member Moran stated the District supports the mission of the SBEP, however, there are some concerns that need to be addressed.

Board Member Griffin asked if a change in management will encourage additional transparency regarding financial matters. She also asked when the last Environmental Protection Agency (EPA) audit was performed. Ms. Seachrist responded the financial audits that have been performed by EPA have provided positive results. Discussion ensued.

Treasurer Dunbar asked for clarification on who can provide the audit. Mr. Kurt Fritsch, Inspector General, responded the audit plan will be presented at the October Governing Board Meeting. The audit plan would have to be amended if SBEP decides to go with a third party review. Treasurer Dunbar asked for an estimate on how long the audit would take. Mr. Fritsch responded approximately three weeks of field time.

Board Member Armstrong requested a timeline be provided with the operational compliance audit. Discussion ensued.

General Counsel Karen West stated there is a 180 day deadline. She suggested the original motion be revised to include the ability for allow staff to make adjustments within the 180 days. She explained the Board must decide prior to the expiration of the 180 day deadline. Ms. West added the provisions in the inter-local agreement required a 180 day notice to withdrawal and an additional 180 days of funding, or until the next fiscal year, whichever is longer. Discussion ensued.

Staff recommended terminating District's participation from the SBEP inter-local agreement. Authorize staff to provide SBEP members notice of District's intent to withdraw unless ongoing management issues within the SBEP are addressed in accordance with Governing Board direction. Reaffirm $15,000, to be matched by SBEP, for an operational and compliance audit of SBEP to be conducted by an independent third-party, or the District's Inspector General.

A motion was made and seconded to approve staff's original recommendation. (01:35:33)

A revised motion was made to approve staff's original recommendation and include the audit must be completed within 90 days according to the guidelines of the audit. This motion was seconded. The motion passed with nine votes in favor and one vote against. (Audio – 01:52:18)

Submit & File Reports

26. Minimum Flows and Levels Priority List and Schedule Update

This item is presented for the Governing Board's information, and no action is required.

27. Initial Reevaluation of the MFLs for Lower Peace River (B081)
This item is presented for the Governing Board's information, and no action is required.

***28.* Reevaluation of Minimum and Guidance Levels for Camp Lake in Pasco County**
This item is presented for the Governing Board's information, and no action is required.

Routine Reports
The following items are provided for the Committee's information, and no action is required.
29. Minimum Flows and Levels Status Report
30. Significant Water Resource and Development Projects

Committee Chair Senft recessed the Committee meeting to allow for the Final Public Hearing for the Fiscal Year 2015-16 Millage Rate and Annual Service Budget and Other Business Meeting. (Audio 00:1:52:50)

Chair Michael Babb reconvened the meeting and relinquished the gavel to Finance/Outreach Committee Chair Dunbar who called the Committee meeting to order. (01:59:55)

Finance/Outreach & Planning Committee
Discussion
31. Consent Item(s) Moved for Discussion - None
32. Legislative Update
Ms. Colleen Thayer, Public Affairs Bureau Chief, provided a legislative update which included a legislative calendar which provided dates for the interim committee meeting beginning in September. The regular session will begin on January 12, 2016.

Ms. Thayer provided an overview of legislative priorities and the budget requests that were presented by the Florida Department of Environmental Protection (FDEP) at the Agricultural and Natural Resource Appropriations Committee in the House.

This item is presented for the Governing Board's information, and no action was required.

Submit & File Reports
33. Information Technology Security Audit - Results of Network Vulnerability Assessment
Treasurer Dunbar stated that 98 percent of the potential 170 million threats were reviewed. The current level of controls is considered adequate to provide coverage of potential threats.

This item is presented for the Governing Board's information, and no action was required.

Routine Reports
The following items are provided for the Committee's information, and no action is required.
34. Treasurer's Report and Payment Register
35. Monthly Financial Statement
36. Monthly Cash Balances by Fiscal Year
37. Comprehensive Plan Amendment and Related Reviews Report
38. Development of Regional Impact Activity Report
39. Significant Activities Report

Treasurer Dunbar relinquished the gavel to the Regulation Committee Chair Moran who called the Committee meeting to order. (Audio – 02:04:13)

Committee Chair Moran stated there was a "*Request to Speak*" card from Mr. Mark Hurst regarding Consent Agenda Item 5a.WUP No. 20012782.001 - Standard Sand & Silica Company/Davenport Location (Polk County), but Mr. Hurst indicated he would speak only at the Board's request.

Regulation Committee
Discussion
40. <u>Consent Item(s) Moved for Discussion</u> - None
41. <u>Denials Referred to the Governing Board</u>
If any denials are requested to be referred to the Governing Board, these will be presented at the meeting.

Submit & File Reports – None

Routine Reports
The following items are provided for the Committee's information, and no action is required.
42. <u>Overpumpage Report</u>
43. <u>Individual Permits Issued by District Staff</u>

Regulation Committee Chair Moran relinquished the gavel to the Operations, Lands and Resource Monitoring Committee Chair Maggard who called the Committee meeting to order. (Audio – 02:04:57)

Operations, Lands and Resource Monitoring Committee
Discussion
44. <u>Consent Item(s) Moved for Discussion</u> - None
45. <u>Hydrologic Conditions Report</u>
Mr. Granville Kinsman, Hydrologic Data Manager, provided a presentation on the hydrologic conditions status report. He stated the August rainfall total was 23 inches. The average for the year is approximately 53 inches. The 12 month departure from mean has dropped by approximately four inches. Groundwater in the northern counties appears to be dropping, above normal in the central counties and rising in the southern counties.

Lakes in the northern region are considered in the normal range; lakes in the Tampa Bay area have dropped due to lower rainfall; the Polk uplands showed a slight increase and Lake Wales Ridge lakes showed a strong increase.

The Withlacoochee River is considered within normal range; the Hillsborough River is above normal range, but declining; reservoirs in the District are considered full or nearing capacity; the Alafia and Peace Rivers are both considered above normal. The public supply for the Peace River is at approximately 12 billion gallons.

Climate forecast projections for October is showing equal chances for above normal conditions and warmer than normal temperatures. The conditions are considered favorable for a stronger than normal El Niño cycle. The forecast for winter and spring are predicted to be above normal rainfall and cooler temperatures.

Board Member Mann asked if the District measures nitrates with the rainfall. Mr. Kinsman responded that he will have to research that information and provide an answer.

This item was presented for the Board's information, and no action was required.

Submit & File Reports

46. <u>Summary of FY2015 Interagency Land Management Reviews</u>
This item is presented for the Governing Board's information, and no action is required.

Routine Reports

The following items are provided for the Committee's information, and no action is required.

47. <u>Structure Operations</u>

48. <u>Significant Activities</u>

Board Member Griffin stated she is unable to attend the October 13 Environmental Advisory Committee meeting and asked if another Board Member would attend. Chair Babb asked Ms. Martin to send an email to the Board as a reminder.

Committee Chair Maggard adjourned the Committee meeting. (Audio – 02:11:57)

General Counsel's Report

Discussion

49. <u>Consent Item(s) Moved for Discussion</u> - None

Ms. Karen West updated the Board on an item that they approved at the July 2015 Governing Board meeting. The Governing Board voted to approve an amicus brief regarding a challenge to the St. John's River Water Management District (SJRWMD) water supply plan. The Governor and Cabinet voted to approve the interpretation of the alternative water supplies statute that the SJRWMD provided, with the support of the other Districts.

Submit & File Reports – None

Routine Reports

The following items are provided for the Committee's information, and no action is required.

50. <u>September 2015 - Litigation Report</u>

51. <u>September 2015 - Rulemaking Update</u>

Committee/Liaison Report

52. <u>Joint Agricultural and Green Industry Advisory Committee</u>
Board Members were provided a written summary of the September 10, 2015 meeting.

53. <u>Other Committee/Liaison Reports</u>
None were provided.

Executive Director's Report

54. <u>Executive Director's Report</u>
Mr. Beltran outlined highlights that displayed the District's successes for Fiscal Year 2015. These included: the spring coast committee that addresses the first five magnitude springs and projects associated with them; the TECO reclaimed project in the Southern Water Use Caution Area (SWUCA); completion of the Lake Hancock P11 structure; the creation of the Polk County Water Cooperative; the achievement of budget metrics; the improvement of the response time to permit applicants; the improvement of the internal contract process; and the completion of five year business plan.

Chair's Report

55. Executive Director's and Inspector General Annual Reports

Chair Babb directed the Board Members to the information that was provided to them regarding evaluations for the Executive Director and the Inspector General. He asked the Board Members to complete the evaluations and return them in two weeks.

56. Employee Milestones

Chair Babb noted staff employees who have reached five-year increments in service to the District. He recognized staff members who have reached these milestones, and thanked them for their service. This item was provided for the Board's information, and no action was required.

57. Other

The October 27 meeting will be in the Brooksville Office. The November 17 and December 15 meetings will both be in the Tampa Service Office.

The meeting was adjourned at 5:29 p.m.

Chair

Attest:

Secretary

From:	Sid Flannery
To:	Xinjian Chen; Yonas Ghile
Cc:	Doug Leeper
Subject:	Fwd: Data included in USF and FWC reports for the Peace River
Date:	Tuesday, August 15, 2017 7:39:27 AM
Attachments:	Peebles 2002 sampling zone map.pdf FWC_Peace Sampling zone discussion and map.pdf

Hello Xinjian and Yonas with cc to Doug,

I have reviewed the draft manuscript that Peter Rubec prepared about fish Habitat Suitability Modeling of the Lower Peace River and Charlotte Harbor that we are listed as co-authors on. Peter said I could send to you my review, which I will do in a second email. He also said he may re-work the discussion section a bit.

The email to Peter below pertains to the fish data the District funded in the Lower Peace River. Peter needed to make some edits to the paper better refer to those studies. I expect Xinjian has zero interest in this, but he might need some more fish in his diet (just kidding),

See second email for my review of the paper.

Sid

---------- Forwarded message ----------
From: **Sid Flannery** <sidflannery22@gmail.com>
Date: Sun, Aug 13, 2017 at 8:16 PM
Subject: Data included in USF and FWC reports for the Peace River
To: "Rubec, Peter" <Peter.Rubec@myfwc.com>

Hello Peter,

A second email will accompany my track_changes edits of the draft manuscript. This email discusses the USF and FWC data in the Peace River. All is well.

As I said before, there is no need to access any data you have not already procured and analyzed for your project. However, to clarify some of the discussion presented in the draft manuscript, some information is presented below regarding on the Peebles plankton data vs. seine and trawl data collected by FWC.

Both the Peebles study and two years of the FWC data collection in the Peace River were funded by the District with me as the project manager. What I suggest below will not change in the findings in your study, but rather how the studies are referred to in the text.

Peebles and USF staff only collected plankton. However, in his 2002 report, Peebles briefly reports some seine and trawl data collected by FWC in the Peace River during the same time frame as the USF study. See the attached sampling zone map from the Peebles (2002) report.

The Greenwood et al. (2004) report published by FWC for the District includes the seine and trawl data collected during the same two-year period as Peebles (it includes the seine and trawl data reported by Peebles). Compared to their FIM sampling, FWC extended their sampling further up the Peace River to coincide with Peebles sampling zones. In the Greenwood et al (2004) report, they combined these data with the FIM monitoring data they had collected in the Peace River over a longer time period. A two-page pdf file that describes and shows a map of the FWC sampling zones in the Peace River is attached.

Since you did not use plankton catch data, it would be better to reference the Greenwood et al. (2004) report to describe special study data collected by seine and trawl in the Peace, rather than citing Peebles (2002).

Also, the manuscript briefly discusses regressions developed by Peebles that predict population distributions in the Peace River in relation to freshwater inflow. The paper correctly says that these regressions were based on plankton catch data. However, these regressions were superceded by the later report by Peebles and Burghart (2013) that added six more months of valuable dry season data. These are better regressions and should be cited in the paper. You will see comments in that regard in my review of the paper, which will accompany another email.

FWC also did regressions to predict population locations in the Peace River, which are described in the Greenwood et al. (2004) report. As my review says, you should include a sentence about those regressions as well on page 14.

In sum, with regard to special studies of the Peace River that extended above the normal FIM zones, those data are included in reports by Peebles (2002), Greenwood et al. (2004) and Peebles and Burgart (2013). In a number of places, the paper says you also used data from the Call et al. (2011) study. Sounds good to me, but I have no experience with that work, so no insight is provided.

By the way - both Peebles and FWC also had special study sampling zones in the Myakka River. Their efforts were combined into one report which I can send to you if you like. I don't know it would be useful to reference that report in the manuscript or not. Would just be in a methods discussion to describe data that were used (FWC only), but that may not necessary since this paper focuses on the Peace.

Nice manuscript!!

Sid

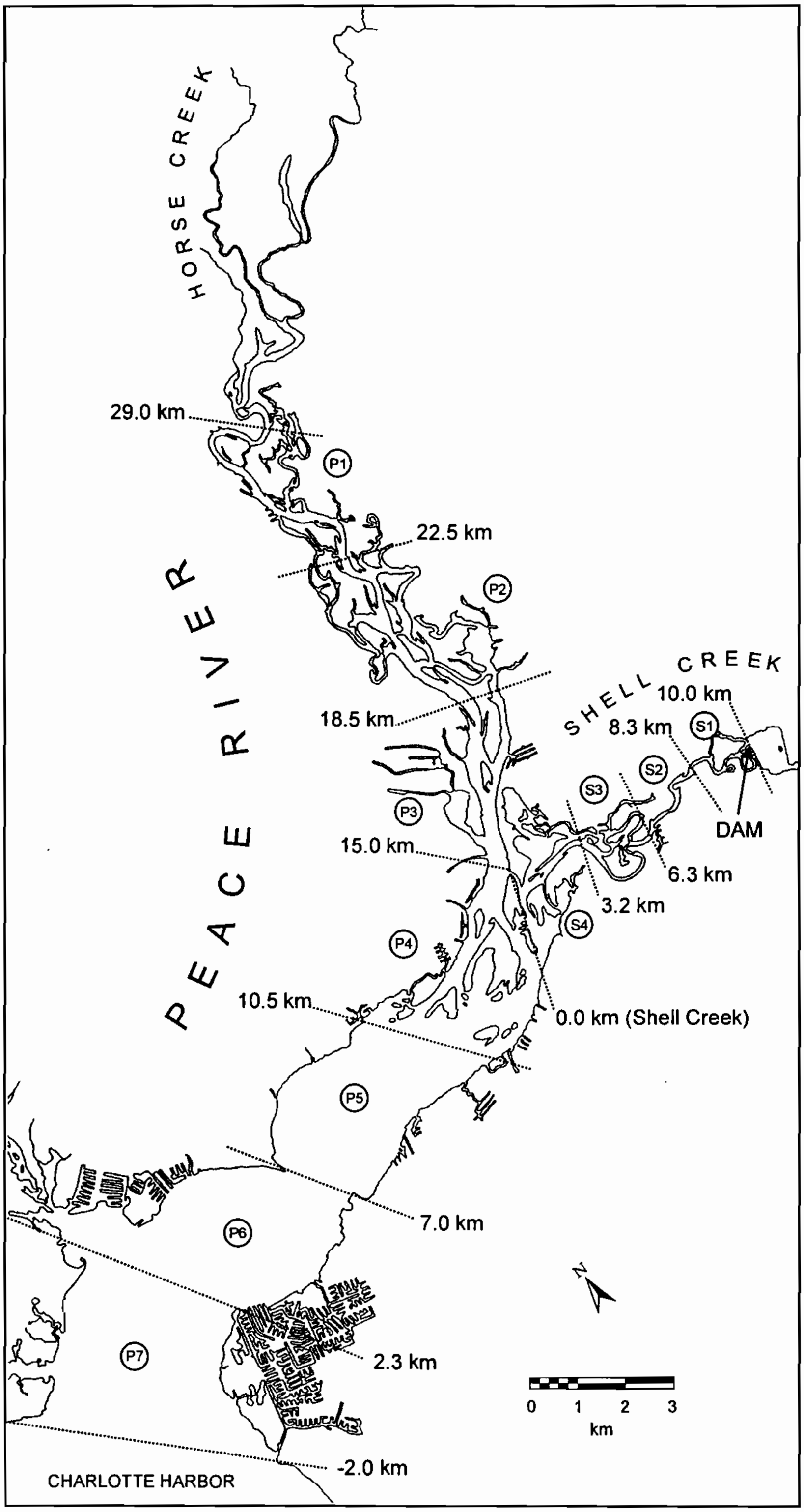

Fig. 2.1.1. Map of survey area. Sampling zones are numbered according to conventions used to label plankton samples.

METHODS

Sampling programs in the Peace River

The present study uses data collected from January 1996 to December 2003 in the main stems of the Peace River and Shell Creek by staff from the Fisheries-Independent Monitoring Program (FIM) of the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute (FWRI). Two different but similar sampling programs provided data for the analyses: a) monthly FIM stratified random sampling (SRS) to monitor relative abundance of fishery resources within Charlotte Harbor, which includes portions of the Peace River between river km 6.8 and 15.4; b) a river project funded by the Southwest Florida Water Management District (SWFWMD), encompassing sampling of the Peace River (river km -2.2 to 29.0) and Shell Creek (river km 0 to 10.2 - these values were subsequently recalculated to better match the lower portion of the study area; Table 1). Sampling effort for the SWFWMD study was stratified into seven zones within the Peace River and 4 zones within Shell Creek (Fig. 1), with two seine hauls per month per zone and one trawl per zone per month.

Table 1 Details of sampling effort for the various projects providing data for this study.

Segment of study area	FIM samples (1996–2003)		SWFWMD samples (April 1997–May 1999)	
	21.3-m seine hauls	6.1-m otter trawls	21.3-m seine hauls	6.1-m otter trawls
Peace River below confluence with Shell Creek (river km -2.20–15.4)	312	253	208	106
Peace River above confluence with Shell Creek (river km 15.41–29.0)	16	4	155	76
Shell Creek (river km 12.9–23.1)	47	19	208	104
Total	375	276	571	286

Study Area

The study was conducted in the tidal portions of the Peace River and Shell Creek (Fig.1).

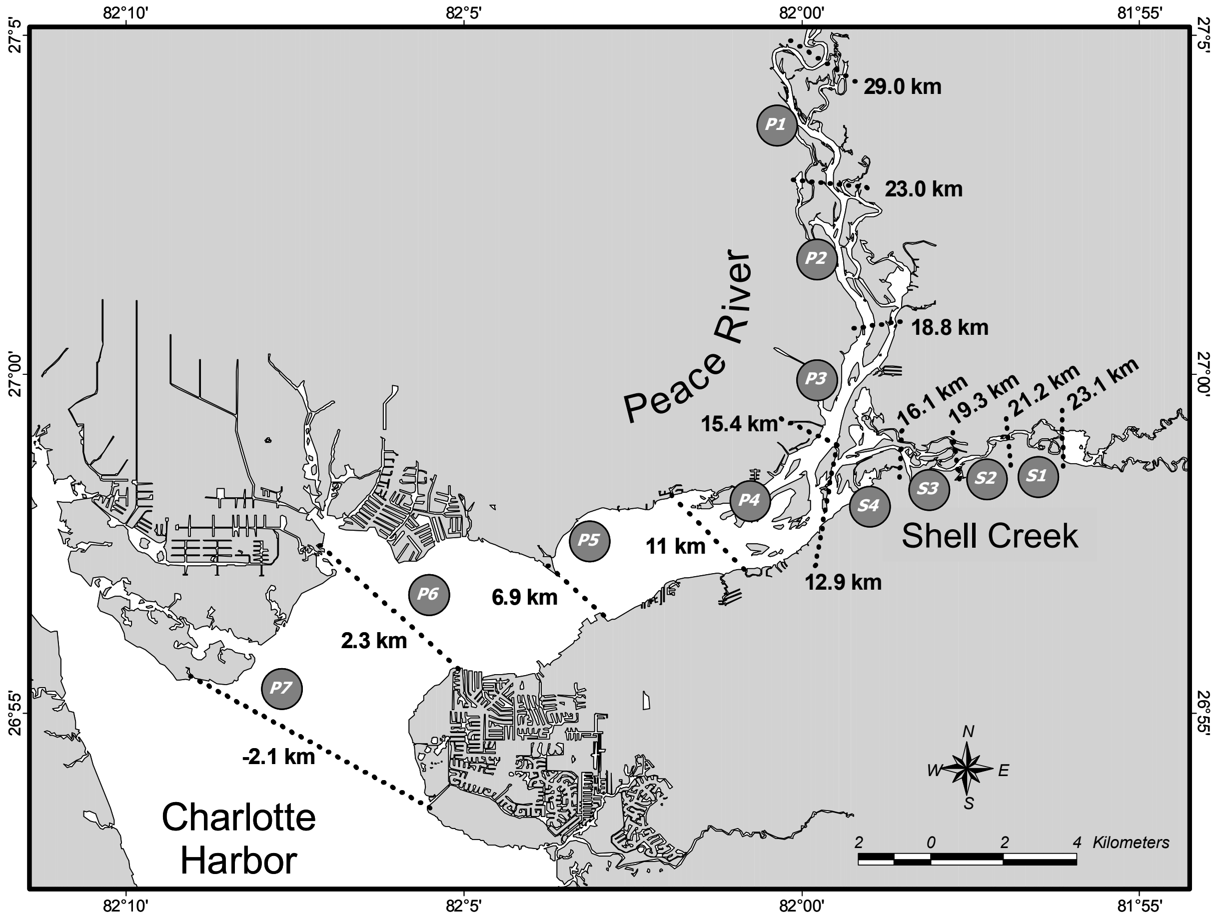

Figure 1. The tidal portion of the Peace River and Shell Creek, with strata from the SWFWMD study noted.

Peebles (2002) succinctly described the study area as follows:

"The tidal portions of the Peace River and Shell Creek form a microtidal, drowned-river-valley estuary that connects to the Gulf of Mexico via Charlotte Harbor. At the mouth of the Peace River, the mixed, mainly semi-diurnal tide has a <1.5 m range. The Peace River/Shell Creek watershed covers an area of 6,086

From:	Sid Flannery
To:	Xinjian Chen; Yonas Ghile
Cc:	Doug Leeper
Subject:	Fwd: review of draft manuscript
Date:	Tuesday, August 15, 2017 7:44:36 AM
Attachments:	Sid edits - Rubec_Draft20_Modeling Assess Spatial Distributions Abundances Estuarine Species CH_8_13_17.docx Sid Notes on draft manuscript.doc

Email below and attachments are my review of Peter's draft manuscript. Again, he said he may re-work the discussion section of the paper.

Have a swell week.

Sid

From: Sid Flannery [mailto:sidflannery22@gmail.com]
Sent: Sunday, August 13, 2017 8:18 PM
To: Rubec, Peter <Peter.Rubec@MyFWC.com>
Subject: review of draft manuscript

Hello again,

Attached are my suggested edits to the draft manuscript. Also attached is a WORD that provides some background for some my edits, some of which is also discussed in the email I just sent you.

Overall, I think this is a very good paper and I think this project will be very useful for the District's determination of minimum flows for the Lower Peace River.

Interestingly, it could also be used to assess the previously adopted minimum flows for the Myakka River, but this another thought for another day, as I don't recall if that river was ever set up for reevaluation.

Good work and please let me know this email and attachments got through.

Sid

Notes for Sid comments on draft spatial modeling manuscript

Comments refer to numbered sf comments on the track changes version of the manuscript submitted as separate file

P1 (comment sf1) The sentence before the comment indicates the SWFWMD is interested only in salinity and temperature. However, the sentence after the comment lists that other types of habitat maps that were created. These sentences seem in conflict, but the suggested edit can make these sentences more compatible. Then later in the abstract, language can be inserted that states that salinity is a focus of the District project and is emphasized in this paper (see comment sf2 below).

As background, we all know that salinity is a focus of the District project because we can model changes in salinity and temperature distributions, but not changes in DO. The District project will therefore simulate changes in salinity and temperature but will have to assume no change in DO, which I think is a reasonable approach given the level of flow reductions we will be considering.

So, I suggest the sentence be added in the second line as shown my edits of the paper. I assume the District will be considering the potential impacts of flow reductions on dissolved oxygen and possibly chlorophyll *a*, so the statement about other physicochemical factors is true. For DO, a simple conclusion that there will be no impacts if good enough. For chlorophyll *a*, the regressions of the location of the chlorophyll max from the previous MFL report (or from the 2014 Atkins report) could be run with the new minimum flows. Point being, my edit about other physicochemical factors is true and reads better.

P1 (sf2) The paper does have quite a bit of emphasis on salinity, such as salinity means and ranges for optimum zones. This would be a good location to put in a sentence or two about the approach for salinity, which provides a nice transition to the next sentence about how the District will be looking at habitat suitability in relation to changes in salinity due to water withdrawals (see added phrase in edit). You could also say changes in temperature, but I think that will be very secondary to the District's analysis (and this paper), thus not needed here.

How do these sentences sound - "Salinity was highly significant explanatory variable during most seasons for the species analyzed. For most of these species, mean salinity values and ranges corresponding to the optimum zones were generally similar among seasons, although their position in the estuary shifted in response to changes in freshwater inflow. (you get the idea, is the correct? what points or language does Peter like?)

P 4 (sf10) I know little about GIS use, so my comments are offered with caution, but the term zones get used throughout the paper, and in a few places it would be helpful to add a word or phrase to describe the zones being discussed. At a minimum, I think the geographic zones (Upper P, Lower P, etc.) could be termed sub-regions. Also, in some places, the term HSM zones is used to differentiate from zonal grids and my edits increase the use of the HRM term a bit. Please check that my edits are not incorrect.

p 4 (sf11) (discussion reprinted from first email) - FWC published a report (Greenwood et al. 2004) that included seine and trawl data collected during the same two-year period as Peebles

(2002). This work was also funded by the District. Compared to their FIM sampling, FWC extended their sampling further up the Peace River to coincide with Peebles sampling zones. In the Greenwood et al (2004) report, they combined these data with the FIM monitoring data they have been collecting in the Peace River over a longer time period. The Greenwood report includes the seine and trawl data reported by Peebles. Since you did not use plankton catch data, it would be better to reference the Greenwood et al. (2004) report to describe special study data collected by seine and trawl in the Peace, rather than citing Peebles (2002).

Page 11 (sf 19) consult both the Peebles 2002 and the Greenwood et al. 2004 reports concerning spawning locations and estuarine residents versus transients. See Table 4 in the Greenwood report. That table has the odd finding of some species are listed as transients but are also listed as spawning in the estuary. May want to talk to Phil Stevens or other FWC staff about estuary residents versus transients. Want to be careful not to over generalize - no real need to in this paper.

Page 11 (sf 21 ands 22) See discussion in first email sent. The Peebles and Burghart (2013) report updated the Peebles (2002) regression analysis with more data and should be the only report cited for the plankton regressions. See Table 1 in that report - all of the taxa moved downstream (negative slopes) in response to increased inflow. Also, the Greenwood et al. (2004) report also listed regressions for locations as a function of freshwater inflow (see Appendix 7).

page 15. See additions for two PBS&J studies to Literature Cited.

page 24 - see edit of caption to denote that red triangles are the data loggers

page 25. Redo caption and Figure title to say sub-regions to get away from use of the word zone in this instance

Spatial Modeling To Assess Distributions and Abundance of Estuarine Species

In the Lower Peace River and Charlotte Harbor, Florida

Peter J. Rubec[1*], Christi Santi[2], Xinjian Chen[3], Yonas Ghile[4] and Michael S. Flannery[5]

1, 2-Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 100 Eighth Ave. SE, St. Petersburg, Florida 33701, USA. Peter.Rubec@myfwc.com, Christi.Santi@myfwc.com.

3, 4, 5-Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida 34604, USA. Yonas.Ghile@swfwmd.state.fl.us, Xinjian.Chen@swfwmd.state.fl.us, sidflannery22@gmail.com

Abstract

The Southwest Florida Water Management District (SWFWMD) is sponsoring research to determine the influence of changes in salinity and other physicochemical factors on aquatic species in the Lower Peace River and Charlotte Harbor, Florida. Using GIS, habitat mapping was conducted for temperature, salinity, dissolved oxygen, depth, and bottom type. Catch rates (CPUEs) were computed using Fisheries-Independent Monitoring data collected by the Florida Fish and Wildlife Conservation Commission from 1996-2013. Habitat suitability models (HSM) based on delta-generalized additive models (GAMs) were applied to eight fish and invertebrate species life-stages (32 life-stages by four seasons) with affinities for low salinities. Three methods for partitioning predicted CPUE grids were evaluated for creation of HSM maps including: equal areas, equal intervals of CPUEs, and natural breaks of ranked CPUEs. Seasonal HSM maps based on natural breaks were created depicting the spatial distributions and relative abundances of early-juvenile, juvenile and adult life-stages. The predicted CPUE grids produced were used to estimate seasonal population numbers for each species life-stage. Further analyses are being conducted tied to a hydrodynamic model of the lower river and harbor to predict habitat suitability in relation to changes in salinity due to freshwater withdrawals. The analyses will help water resource managers make regulatory decisions concerning minimum flows and levels for freshwater inflows that conserve the estuarine ecosystem.

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Deleted: temperature

Commented [sf1]: See discussion in other WORD file

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Commented [sf2]: see comment in WORD file. Would be good to add a sentence or two here about emphasis on salinity

Commented [sf3]: Took out SWFWMD as it is an acronymn and is not needed in the abstract

Deleted: SWFWMD

INTRODUCTION

The Southwest Florida Water Management District (SWFWMD), by virtue of its responsibility to permit the consumptive use of water and a legislative mandate to protect water resources from "significant harm", has been directed to establish minimum flows and levels (MFLs) for rivers and streams within its boundaries (Section 373.042, Florida Statutes) (SWFWMD 2010). As currently defined by statute, "the minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or the ecology of the area."

Fundamental to the approach used for development MFLs is the realization that a freshwater flow regime is necessary to protect the ecology of both riverine and estuarine systems (SWFWMD 2010). The initial step in this process requires an understanding of historic and current flow conditions to assess the extent to which water withdrawals or other anthropogenic factors have affected flows. It has been demonstrated that flow declines in the Peace River can be ascribed to both climatic variation and anthropogenic effects (PBS&J 2007, SWFWMD 2010).

Commented [sf4]: flow declines are not in the Lower Peace River, per se

Deleted: Lower

Commented [sf5]: references are needed here, these will do

To elucidate how aquatic species respond to changing environmental conditions in the tidal Lower Peace River and its receiving estuary, Charlotte Harbor, the SWFWMD has sponsored research and monitoring of phytoplankton, zooplankton, fish and macro-invertebrate species composition and abundance in relation to freshwater inflow, salinity, temperature, as well as other water-quality and benthic habitat variables (SWFWMD 2010).These data supplement Fisheries-Independent Monitoring (FIM) data collected by the Florida Fish and Wildlife Conservation Commission-Fish and Wildlife Research Institute (FWC-FWRI) sponsored by the USFWS Sport Fish Restoration program. The studies found that conditions vary seasonally and that fish and invertebrate communities vary along salinity gradients in a complex manner (Flannery et al. 2002; Peebles 2002; Greenwood et al. 2004; Idelberger and Greenwood 2005; Greenwood 2007; Peebles et al. 2007; Call et al. 2011, 2013; Peebles and Burghart 2013; Stevens et al. 2013).

Commented [sf6]: I think the word "has" correctly suggests that monitoring and research is ongoing

FWC-FWRI has been conducting habitat suitability modeling (HSM) for the Lower Peace River and Charlotte Harbor in support of setting MFLs. A Delta-type generalized additive model (GAM) program was previously developed by FWC-FWRI using R software to support the creation of seasonal HSM maps in Tampa Bay (Rubec et al. 2016a). In the present study, we applied Delta-type GAMs to study the influence of salinity and temperature conditions on spatial distributions and population abundances of selected estuarine species by early-juvenile (EJ), juvenile (J) and adult (A) life-stages in the Lower Peace River and Charlotte Harbor. For Hogchoker and Blue Crab, respectively, juvenile and adult life-stages (JA) were analyzed together. The FIM data collected by FWC-FWRI and water quality data collected by SWFWMD were utilized for habitat mapping and HSM analyses. One of the main goals in the study was to estimate population numbers for species life-stages from predicted CPUE grids. We have evaluated three methods for partitioning predicted grids to create HSM maps. It represents the first phase of our study to evaluate potential impacts of freshwater withdrawals on species distributions and population abundances in the Lower Peace River and Charlotte Harbor.

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METHODS

The steps used to analyze FIM datasets with an excess of zero catches are as follows. First, environmental data values obtained from FIM sampling are interpolated using GIS to create habitat grids. Second, environmental data associated with central data points from 15 m x 15 m grid cells are exported. Third, the R program is used to associate CPUEs derived from FIM data (about 2,000 to 3,000 samples per season across years) with spatially corresponding environmental values in an HSM. Fourth, the model developed is used to predict CPUEs from the environmental data associated with the habitat grids. Then, the predicted CPUEs are imported into a GIS to create a predicted CPUE grid across the estuary. The predicted CPUE grid is partitioned into four HSM zones to create seasonal HSM maps. Histograms of observed mean gear-corrected (GC) CPUEs across HSM zones are used to spatially verify the reliability of the predicted HSM maps.

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Habitat Mapping
The Center for Spatial Analysis within FWC-FWRI created habitat grids and maps to depict bottom types and bathymetry in Charlotte Harbor including lower portions of the Myakka and Peace Rivers.

Bottom Type Mapping
Seagrass studies demonstrate the importance of submerged aquatic vegetation (SAV) as indicators of water quality and important habitat for associated fish fauna (Tomasko and Hall 1999, Corbett 2006, Corbett and Hale 2006, and Greenwalt-Boswell et al. 2006). Seagrass coverages in Charlotte Harbor are created from data collected using aerial photography about every two years since 2002. FWC-FWRI reviewed SAV shape files for Charlotte Harbor obtained from SWFWMD. We chose the 2012 SAV coverage as being most representative for use with a new benthic habitat map for Charlotte Harbor.

Mud polygons were created from a bottom type dataset created by NOAA (Bathymetric Fishing Charts 1989). Patchy and continuous seagrass were recorded as "SAV". Using ArcGIS 10.2.2, the command "Erase" was run on the Mud polygons to eliminate any overlap with the SAV and bare mud polygons. The resulting mud and SAV polygons were merged in ArcGIS. Areas within the study area that were not mud or SAV were coded as "sand". This vector dataset was converted to a 15 meter raster in ArcGIS. A hard copy bottom type map, a categorized bottom type grid and metadata were created.

Bathymetry Mapping
Bathymetry data collected by Wang (2012) of the University of South Florida (USF) were obtained from SWFWMD for the Lower Peace River, Shell Creek, Upper Charlotte, Middle Charlotte, and Myakka River. Point data from the bathymetry dataset were merged into a single point feature class. Additional data for Gasparilla Sound were obtained from NOAA in areas where data were not present in the SWFWMD dataset. This included data from hydrographic surveys H08192 and H08193 collected in 1955 and 1956. The depth values for the hydrographic surveys were converted from MLW to NAVD88 using NOAA's Vertical Datum Transformation v. 3.4 (v Datum). The NOAA data and SWFWMD data were merged into a single point feature class. Empirical Baysian kriging (Krivoruchka 2012) was used to interpolate bathymetry data in different sections of Charlotte Harbor with the ArcGIS Geostatistical Analyst 10.3 extension. The interpolated layer was exported to a raster with 15m x 15m cell size. The output raster grid was clipped to the water area within the study area. Large backwaters and canals with no bathymetry surveys were removed, but some smaller backwaters were included. A bathymetry map, continuous bathymetry grid categorized to 1-m intervals, and metadata were created.

Seasonal Habitat Grids for Salinity, Temperature, and Dissolved Oxygen
There are several water quality monitoring programs being conducted within Charlotte Harbor. The first source of data is that collected by the FWC-FWRI FIM program. The data are collected at randomly chosen stations in conjunction with sampling of estuarine fish and invertebrates. A second source of water quality data is that collected at fixed stations using data recorders deployed by the Peace River Manasota Regional Water Supply Authority and the United States Geological Survey (USGS). These stations are located at varying distances from the mouth of

Commented [sf8]: see edit to caption for Figure 1 - need to denote it is the red triangles that are the data loggers the Lower Peace River near Punta Gorda (Figure 1). The Peace River Facility depicted on the map is the site where water withdrawals have been conducted.

The seasons chosen in the present study correspond to four, three-month periods with generally different river flow patterns in the region (PBS&J 1999, Flannery al. 2002). The fall (Oct-Dec) and spring (April-June) typically correspond to dry periods with low flows in the rivers entering Charlotte Harbor, though flows can be high in early October and tend to increase in mid-June. A minor seasonal peak in flows often occurs in the late winter to early spring (Jan-March) due to rains associated with the passage of cold fronts. Summer (July-Sept) is the wet season associated with higher rainfall and high flows in the Peace and Myakka Rivers.

Fisheries-Independent Monitoring

FIM sampling has been conducted by FWC-FWRI in Charlotte Harbor since 1989. In the present study, we analyzed FIM data gathered from 1996 to 2013. Long-term FIM sampling has been conducted in geographic ~~Zones~~ Sub-Regions A, B, C, and M of Charlotte Harbor and the Lower Peace River (Lower P) up to the I-75 bridge (about 10.5 km from the river mouth) (Figure 1). The ~~area~~ sub-region north of the bridge (Upper P) did not receive long-term FIM sampling (Figure 2). Since the latter ~~area~~ sub-region is important for the present study, we also obtained data collected in Upper P associated with two special studies conducted from April 1997 to March 1998 Greenwood et al. (2004) and July 2007 to June 2010 (Call et al. 2011).

The SAS program used to extract data from the FIM database averaged surface and bottom readings for temperature, salinity, and dissolved oxygen at each sampling station. The surface and bottom data from the special studies were also averaged at various station locations. Seasonal datasets across years were created to support spatial interpolation of the point data (by latitude and longitude) for temperature (°C), salinity (‰), and dissolved oxygen (mg/L).

Fixed Station Data

RM Environmental provided water quality data collected (1996-2013) by the Peace River Manasota Regional Water Supply Authority and by the USGS. Large datasets (most with >200,000 records) were obtained from data loggers which continuously recorded data at fixed stations in the Lower Peace River (Figure 1). Surface and bottom readings from the fixed station data recorders for temperature and salinity were separately averaged within months across years using SAS JMP v5 (SAS 2002). Then, the surface and bottom values were averaged for each month. Finally, the monthly values were averaged within each season.

Points from the FIM database (1996-2013) and the special studies (Greenwood 2004, Call et. al., 2011) were plotted using ArcGIS 10.3 and were grouped by seasons to create datasets similar to those derived from the continuous recorder data. Surface and bottom readings for temperature, salinity and dissolved oxygen were seasonally averaged. Repeated samples in the same location within a season were also averaged.

Spatial Interpolation of Environmental Data

Empirical Bayesian kriging was performed using the ArcGIS 10.3 Geostatistical Analyst extension (ESRI, 2014). The interpolated layers created were exported to a raster with 15m x 15m cell size. The output raster grids were clipped to the water extent within the Charlotte

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Harbor study area. The same extent as the bathymetry data was used, with the exception of small portions of Lemon Bay and upstream Myakka River, where we did not have temperature, salinity, and dissolved oxygen data. These areas were excluded from the final grids. Seasonal grids for temperature, salinity, and dissolved oxygen were created, as well as categorized maps in PDF format, and GIS metadata.

Estuarine Species Modeled

Eight species life-stages were selected based on the criterion that they exhibit preferences for low (oligohaline) or moderate (mesohaline) salinities and have been found to be abundant in the Lower Peace River. The first 6 species exhibited affinities for low salinity in a previous habitat HSM study in Charlotte Harbor (Rubec et al. 2016b). Hogchoker and Blue Crab were added after consultation with Dr. Ernst Peebles (USF College of Marine Science). Size ranges selected for fish were based on standard length (SL). Size ranges for blue crab were based on carapace width (CW).

a) J-Bay Anchovy (*Anchoa mitchilli*) (15-29 mm SL).
b) A-Bay Anchovy (*Anchoa mitchilli*) (30-60 mm SL)
c) EJ-Southern Kingfish (*Menticirrhus americanus*) ((10-119 mm SL)
d) EJ-Red Drum (*Sciaenops ocellatus*) (10-299 mm SL)
e) EJ-Spot (*Leiostomus xanthurus*) (10-149 mm SL)
f) J-Sand Seatrout (*Cynoscion arenarius*) (10-149 mm SL)
g) JA-Hogchoker (*Trinectes maculatus*) (10-100 mm SL)
h) JA-Blue Crab (*Callinectes sapidus*) (10-150 mm CW)

Catch numbers, effort, and associated environmental data (temperature, salinity, dissolved oxygen, depth, and bottom type) for the selected species were extracted from the FWC-FWRI FIM database for the seasons defined in the present paper. Data from the two special studies in Upper P (Greenwood et al. 2004, Call et al. 2011) were merged with FIM data collected in Charlotte Harbor and the Lower P section of the Lower Peace River. The results of the special studies have been published in papers by Stevens et al. (2013), and Call et al. (2013).

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The FIM program uses five gear types for sampling fish and invertebrates in the study area including a 21.3-m circular bag seine (gear 20), a 21.3-m boat bag seine (23), a 183-m haul seine (160), a 61-m haul seine used in the river (180) and a 6.1-m otter trawl (300). The CPUEs associated with the gear types are standardized within the Delta-GAM R program used for HSM. Depending on selectivity for the size of the species analyzed, not all of the gear types were used in each HSM analysis.

The statistical approach taken involves the creation of Delta-type GAMs, which separately fit non-linear splines to positive catch-per-unit-effort (+CPUE) and to probability of zero occurrence (P=0) data across environmental gradients. The +CPUE component is based on either gamma (ZAGA) or beta (BEINF0) statistical distributions. The statistics and methodology are described by Rubec et al. (2016a).

The HSM are built using statistical functions that choose the best combination of environmental variables based on the lowest Akaike Information Criterion (AIC). The program first chooses the best Full model. The analyst can then choose from three spline-fitting methods based on Owen's residual plots and lowest AIC. After the best HSM model is created from FIM sampling data; it creates predicted CPUEs (no/m^2) for 15m X 15m cells across the estuary. Various graphical outputs are created that help the analyst determine goodness-of-fit. Statistical tables for the Full model and the Reduced Model show which factors are most significant. The results presented are derived from the Reduced Model.

Transformed splines (not presented) were separately fit to +CPUE data (MU) and to probability of zero occurrence data (NU) across environmental gradients. Then the spline data were back-transformed and the two components multiplied (MU X NU) to derive back-transformed GC-CPUE splines across gradients for water temperature, salinity, dissolved oxygen and depth. Splines were created for both the Full and Reduced models. Histograms with mean GC-CPUEs by bottom type and by gear type were also created with the R program. Seasonal graphs showing back-transformed splines for GC-CPUEs versus salinity are presented for each species life-stage.

Originally we planned to fit models using data collected from 2004-2013 and to conduct verification tests using data collected from 1996-2003. However, this was not possible considering the limited amount of data available from the Upper P portion of the Lower Peace River associated with the special studies previously discussed. Consequently, we used all of the data collected from 1996 to 2013 with seasonal Delta-type GAMs (either Delta-gamma GAM or Delta-beta GAM) .

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Model Input GIS Data

Using ArcGIS for Desktop version 10.3, raster data were converted to vector point data at grid centroids (ESRI 2014). Using ArcGIS Spatial Analyst "Extract Multi Values to Points", attributes representing depth, bottom type, temperature, salinity and dissolved oxygen were added to seasonal point files. FIM point data for each species life-stage by season were spatially joined to the seasonal point files with habitat data. Each FIM data point was joined to the closest habitat point within 50 meters. These data were converted to CSV format for use in the models.

Model Output GIS Data

The CPUEs associated with the gear types were standardized within the R program. Gear-corrected CPUE data were used to create continuous raster datasets for each species life-stage by season. Using ArcGIS, the CSV files were converted to a 15 meter raster cell size, with the same cell alignment as the grids created for the habitat grids. Using the HSM, predicted CPUE grids were produced for each species life-stage by season. By partitioning the predicted GC-CPUE grid into four HSM zones, grids were created depicting zones of abundance and the spatial distributions of each species life-stage.

Partitioning CPUE Grids

Three different methods were evaluated for partitioning predicted CPUE grids to create zonal grids. The first method involves dividing the predicted CPUE grids based on equal intervals (EI) of CPUEs for each of the four HSM zones. The second method partitioned the grids with approximately equal areas (EA) for each zone. There are some differences in the percentages of the total area because the GIS software selects cells that are contiguous to determine the area of each zone. Third, by using the ArcGIS Spatial Analyst "Slice" tool, continuous raster data were assigned to four HSM zones using natural breaks (NB). The natural breaks method "specifies

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that the classes will be based on natural groupings inherent in the data. Break points are identified by choosing class breaks that best group similar CPUE values, which maximize the differences between classes. The cell CPUEs are divided into classes, whose boundaries are set where there are relatively big jumps in the data values."

Population Tables
Seasonal population numbers were estimated by summing the GC-CPUEs in each predicted CPUE grid across the cells in the study area for each species life-stage. Computations determined that there were 1,906,683 15m X 15m cells with a total area of 429,003,675 m^2.

To help evaluate the three methods for creating zonal grids, a table was created that computed zonal percentages of the total area associated with the seasonal zonal grids (EA, EI, and NB) for each species life-stage.

Zonal population estimates were derived for the three methods by multiplying mean GC-CPUEs (no/m^2) by the zonal areas (m^2) associated with the zonal grids. Tables were created that computed percentages of the total population numbers associated with each of the HSM zones in the zonal grids. Seasonal percentages of the total population numbers by HSM zones are presented for the NB method. Percent confidence intervals (± CI %) for each of the zones were also computed by season.

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Creation of HSM Maps
Seasonal HSM maps were created from the zonal grids (EA, EI, and NB) for all species life-stages. Each HSM map created has four habitat suitability zones: L-Low, M-Moderate, H-High, and O-Optimum representing increasing mean CPUEs across the zones. Tabular analyses indicated that the NB method was the best choice for creation of HSM maps.

Salinity Ranges By HSM zones
Using ArcGIS 10.4.1 Spatial Analyst, zonal statistics were created for each HSM grid based on the seasonal salinity values present for each zone. This tool summarizes values of the seasonal salinity raster within the HSM zones. Seasonal means and ranges of salinity derived from salinity grids corresponding to Optimum zones determined by HSM for each species life-stage are presented in a table.

Verification Tests
Using ArcGIS, FIM point data for each species life-stage, within each season, were spatially joined to the zonal grid data to create verification datasets. Each FIM data point was joined to the closest grid centroid within 50 meters. We verified each model by overlaying the observed data onto predicted HSM zones to create verification graphs. Increasing mean CPUEs across the zones indicate agreement between the observed mean CPUEs and predicted mean CPUEs.

RESULTS

Habitat Maps
Examples of the habitat maps for temperature, salinity and dissolved oxygen during summer and annual maps for depth and bottom type are presented (Figure 3). Salinity is of special interest

due to the direct relationship between freshwater inflow and salinity and the need to set MFLs in order to manage freshwater withdrawals from the Peace River (SWFWMD 2010).

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Statistical Table Reduced Model.
There are actually two tables appended together (Table 1). The first represents the MU side and the second represents the NU side of the Delta-GAM. The statistical predictions are derived from CPUE relationships associated with the environmental variables presented. The Reduced model used the lowest AIC to select the best combination of environmental variables. Non-significant variables listed in the table were included in the models. Blank spaces in the table indicate factors that were not included in final models. For the sake of brevity, the significance of different gear types are not presented in the table.

In most cases, salinity was highly significant for the eight species life-stages analyzed (Table 1). For J-Bay Anchovy and A-Bay Anchovy salinity was highly significant during spring (SP), summer (SM), and fall (FL) for the MU side of the model. But, considering the significance of both NU and MU sides of the models, all four seasons were significant for both juvenile and adult Bay Anchovy. Temperature, depth and/or dissolved oxygen were significant during several seasons and submerged aquatic vegetation (SAV) was significant during the spring. The JA-Blue Crab and JA-Hogchoker exhibited highly significant affinities for salinity during all seasons. Temperature was significant during the fall, spring, and summer seasons. Salinity was most significant for EJ-Red Drum during FL and winter (WN). Salinity was highly significant during most seasons for EJ-Southern Kingfish, EJ-Spot, and J-Sand Seatrout.

CPUE By Salinity Graphs
In order to determine optimum salinities that contributed to significant catch rates(Table 1), the graphs for CPUE by salinity were aggregated for each species life-stage by season (Figure 4).The JA-Hogchoker exhibited high CPUEs at salinities <5 ‰ for all four seasons. The CPUE splines for J-Sand Seatrout peaked near 7 ‰ during all four seasons. The CPUEs for JA-Blue Crab peaked at about 10 ‰ in FL and WN, at 8 ‰ in SP and <5 ‰ in SM. The CPUE curves for EJ-Southern Kingfish peaked at 15 ‰ in FL, and near 18 ‰ during WN, SP and SM. The splines for J-Bay Anchovy and A-Bay Anchovy are similar during all four seasons with peaks for the fitted CPUEs near 18 ‰. EJ-Red Drum CPUEs peaked near 20 ‰ in FL, < 10‰ in WN and <5 ‰ in SP and SM. The splines for EJ-Spot peak at >30 ‰ in FL, at 8 ‰ in WN and < 5 ‰ in SP. The EJ-Spot spline for SM shows a declining CPUE relationship at low salinities (< 5 ‰) and increasing CPUEs at high salinities (>30 ‰).

Population Estimates
The population numbers for J-Bay Anchovy were estimated at about 1 billion in FL, 543 million in WN, 2 billion in SP, and 2.5 billion during SM (Table 2). Adult Bay Anchovy were estimated to be about 1 billion in FL, 608 million in WN, 2.5 billion in SP, and 2.5 billion in SM. The JA-Blue Crab numbers were 1.25 million in FL, 3.5 million in WN, 1.1 million in SP, and about 923,000 in SM. The JA-Hogchoker population numbers were 4.2 million in FL, 2.3 million in WN, 2 million in SP and 1.9 million in SM. J-Sand Seatrout numbers were 102,000 in WN, 530,000 in SP, 5 million in SM and 2.65 million in FL. EJ-Southern Kingfish estimates were 199,000 in WN, 2.6 million in SP, 2.75 million in SM and 1.37 million in FL. The EJ-Red Drum estimates range from 9.3 million in FL, 2 million in WN, 256,000 in SP, to 59,850 in SM. EJ-

Spot population numbers were 56.6 million in WN, 1.7 million in SP, about 324,000 in SM and 27,744 in FL.

Percent of Total Area By Habiata Suitablity Zones In Zonal Grids

As one might expect, the percentages of the total area were close to 25% for each of the HSM zones in the EA grids for most species life-stages (Table 3). The zonal grids for Hogchoker and Sand Seatrout exhibit higher EA percentages ranging from 26-34% of the total EA area in the Low zone for all four seasons. The proportions of the total area are highest in the Low zone for the EI zonal grids with percentages ranging from 66-99% across all species life-stages. Areas for Optimum zones are ≤ 5% of the total area. A high proportion (19/32) of the Optimum zones occupy <1% of the total EI area. With the NB zonal grids, only 4/32 of the Optimum zones occupied <1% of the total area. Hence, NB zones are a better choice than EI zones based on the zonal grid analyses.

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Percent Total Population Numbers By Habitat Suitability Zones

With EA grids, the percentages of total population numbers in Optimum zones ranged from45-87% across all seasonal species-life stages. In contrast, the percentages of the population numbers in Optimum zones for the EI grids ranged from <1-18% across all species life-stages. The percent of total population numbers for each species life-stage were spread more equally between the four zones with the NB grids (Table 4). For NB grids, the percentages of total population numbers in the Optimum zones ranged from 3-40% for species life-stages across seasons.

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Percent Confidence Intervals By Habitat Suitability Zones

Confidence intervals are presented as percentages of the population estimates (± CI%) by season within the four zones for the NB zonal grid method (Table 4). Relatively tight (<10% CIs) were found by NB zones for all seasons for juvenile and adult Bay Anchovy, Blue Crab, Southern Kingfish and Red Drum. Hogchoker, Sand Seatrout, and Spot exhibited higher % CIs in Optimum zones ranging from 16-55%. This probably is due to the reduction in areas of Optimum zones for NB compared to the EA method (Table 3). The areal reductions for NB Optimum zones are not as great as the areal reductions for EI Optimum zones.

Zonal Comparison HSM Maps

Seasonal HSM maps were created from the EA, EI and NB zonal grids respectively for 32 species life-stages. The Optimum zone represents the area with the highest abundance. In most cases, predicted Optimum zones were found to occur in the Lower Peace River. Figure 5compares HSM maps prepared from the EA, EI and NB zonal grids for A-Bay Anchovy in SP and for EJ-Southern Kingfish in FL.

Visual examination of the HSM maps (EA, EI, NB) for all species life-stages indicate that the Optimum zones based on EA zonal grids occupy too large an area to support decision making. The Optimum zones for HSM maps based on EI grids tend to occupy too small an area. The Optimal zones for some EI-based HSM maps were not visible on the maps. These are associated with Optimum zones for species life-stages with areas <1% of the total area (Table 3).The HSM maps derived from NB zonal grids are about the right size for the purpose of water management. Hence, only HSM maps based on NB are presented and discussed.

Seasonal HSM Maps For Species Life-Stages

Seasonal HSM maps are presented for J-Bay Anchovy (Figure 6). The Optimum zones are located in the Lower Peace River and in the Myakka River during the FL, WN, and SP seasons. These seasons have reduced rainfall and lower inflows to the estuary. During SM, the Optimum zone expanded from the rivers into northern Charlotte Harbor in shallow water areas (<2 m) occupied by SAV. Summer is the wet season associated with higher rainfall and increased freshwater inflow from the rivers into the estuary. Almost identical Optimum zone patterns were found with the seasonal HSM maps for A-Bay Anchovy. Hence, juvenile and adult Bay Anchovy responded in a similar manner to seasonal changes in freshwater inflow.

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Seasonal HSM maps for JA-Hogfish (not presented) and JA-Blue Crab (Figure 7) show that they are abundant in the Upper P sub-region of the Lower Peace River (Figure 1). The Optimum zones for Hogfish extended further up the Lower Peace River in Upper P during all seasons than the Optimum zones for Blue Crab. There is some contraction of Optimum zones for both species during SP and some expansion during SM (Table 3). EJ-Southern Kingfish also were abundant in the Lower Peace Rivers during all four seasons. But, the Optimum zones were further downstream in the Lower P section of the river.

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The HSM maps for J-Sand Seatrout (not presented) show they were abundant in the Upper P sub-region of the river during SP and expanded their range downstream into Lower P and the upper portion of Charlotte Harbor in SM. The Optimum zones indicate that some juveniles were found in the Upper P part of the river during FL and WN.

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Based on Optimal zones in seasonal HSM maps, EJ-Red Drum were most abundant over SAV in Charlotte Harbor in FL (Figure 8). They were most abundant in the Upper P sub-region of the Lower Peace River during WN. The Optimum zones indicate they moved downriver into Lower P and into northern Charlotte Harbor in SP, being most abundant in shallow water over SAV. The HSM map for SM does not show them being present in the northern part of Charlotte Harbor. Some were still present in the Lower P sub-region of the river in SM.

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The HSM maps for EJ-Spot show they were abundant in the Upper P section during WN and SP. After that, they were only found in small areas near the mouth of Charlotte Harbor during SM and FL. This indicates that, they leave the estuary after spending about six months in the river. The movement out of Charlotte Harbor during SM was unexpected.

Salinity Ranges For Optimum Zones

The salinity ranges and mean salinities associated with Optimum zones for species life-stages are presented (Table 5). EJ-Hogchoker were found at the lowest range of salinities during all four seasons. J-Sand Seatrout were also found at low salinities in Upper P at somewhat higher salinity ranges than the Hogchoker. Each species appears to select different salinity ranges proceeding downstream. The species order from low to higher salinities is EJ-Hogchoker<J-Sand Seatrout <JA-Blue Crab <EJ-Kingfish<J-Bay Anchovy<A-Bay Anchovy<EJ-Red Drum<EJ-Spot.

Verification Graphs

Histograms were created for observed mean GC-CPUEs by HSM zones from the EA, EI and NB datasets. Increasing mean CPUE relationships across HSM zones were scored by season for each species life-stage (Table 6). An example for A-Bay Anchovy in fall based on NB is presented (Figure 9). Associated with each mean CPUE are 95% confidence limits. Total seasonal verification scores for the EI method across all eight species-life stages range from 5.0-5.5 (Table 6). With the EA method, total scores by season range from 7.5 to 8.0. With NB, the total scores by season range from 7.0-8.0. This indicates that the verification tests associated with the EA and NB methods performed better than with the EI method.

DISCUSSION

The statistical analyses indicate that salinity was highly significant during most seasons for the eight species analyzed (Table 1). The CPUE by salinity graphs show the optimum salinity and approximate ranges of salinity where each species life-stage was most abundant (Figure 4). Most of the seasonal graphs are similar for each species life-stage tending to indicate that most species have a preferred salinity range. The Bay Anchovy, Blue Crab, Hogchoker and Southern Kingfish are estuarine residents, which reproduce in the estuary and can remain there during all life-stages (Peeebles 2002, Greenwod et al. 2004, Call et al. 2011). Other species including Red Drum and Spot, herein termed estuarine transients, leave the estuary to spawn in the Gulf of Mexico.

Some of the species determined to spawn in or very near the tidal Peace River, based on the presence of eggs or early larval stages, included Bay Anchovy, Sand Seatrout, Southern Kingfish, and Hogchoker (Peebles 2002). Blue Crab are also estuarine-residents, although no eggs or larvae were collected. The species mentioned spend most of their life in the estuary (Idelberger and Greenwood 2005, Stevens et al. 2013). Other species such as Sand Seatrout, Spot and Red Drum were found in other studies to spawn in the Gulf of Mexico, after which early life-stages move into the estuary (Patillo et al. 1997).

The report by Peebles (2002) indicates the Sand Seatrout spawns in the Charlotte Harbor system in or near the tidal Peace River. However, the literature reviewed by Patillo et al. (1997) states that Sand Seatrout spawn in the Gulf of Mexico. Most spawning appears to occur in the Gulf primarily in waters between 7 m and 15 m in depth, but can occur in depths up to 91 m and as far as 175 km from shore (Cowan and Shaw 1988). In the present study, the seasonal CPUE by salinity graphs and the HSM maps indicate that Sand Seatrout in the Charlotte Harbor system are estuarine residents. There is no indication in the seasonal HSM maps that they move to higher salinities near the mouth of the estuary or that they move out of Charlotte Harbor.

Based on plankton catch data, over 20 taxa of fish and invertebrates displayed significant distributional responses to the rate of freshwater inflow, (Peebles and Burghart 2013). While all the taxa moved downstream in response to increased inflow, the distribution of different taxa in the river was staggered and some were located farther upstream than others. Based on seine and trawl data, Greenwood et al. (2004) similarly found that various life-stages of 14 taxa had distributional responses in relation to freshwater inflow.

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Commented [sf22]: See Appendix 7 in Greenwood et al (2004) for analysis of distributional response - Double check my 14 taxa number - some of which may have had more than one stage signficant with flow, but report the species.

The seasonal HSM maps for JA-Hogchoker (not presented) show optimum zones of abundance in the Upper P section of the Peace River for all four seasons. This is consistent with the CPUE by salinity graphs by season which show their highest abundance at < 5 ‰ (Figure 4). The seasonal splines for JA-Blue Crab, J-Sand Seatrout, EJ-Southern Kingfish, J-Bay Anchovy and A-Bay Anchovy are similar within each species across seasons. The CPUE by salinity graphs tend to agree with the Optimum zones of abundance depicted in the HSM maps that were derived from zonal grids using NB. Each species tends to occupy a different range of salinity progressing downstream in the Lower Peace River. This is good evidence that the main factor influencing their spatial distributions and Optimum abundances is the salinity gradient.

Some of the seasonal HSM maps for resident species show an expansion of their spatial distributions in the Lower Peace River during SM associated with higher freshwater inflows (Table 3). The fact that there were no corresponding changes in the fitted CPUE splines, for most of the estuarine residents, may be explicable. Preferred salinity ranges for each species stay about the same, while the salinity zones expand in area as freshwater inflows increase. In most cases, Optimum zones of abundance depicted in the HSM maps expanded. But, the salinity ranges associated with the Optimum zones did not change to any great degree (Table 5). The largest expansions of Optimum zones occurred with J-Bay Anchovy in SM (Figure 6) and A-Bay Anchovy in SM.

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According to published literature, Red Drum spawn in the Gulf of Mexico during September near the mouths of estuaries (Peters and McMichael, Jr. 1987; Patillo et al. 1997). Based on Optimum zones in our seasonal HSM maps, early-juveniles were most abundant over SAV in FL (Figure 8). In WN, they moved into the Upper P section of the Lower Peace River. The Optimum zones for SP indicate they then moved downriver into Lower P and into northern Charlotte Harbor, being most abundant in shallow water over SAV. Some were still present in Lower P during SM. But, none were found downstream in Charlotte Harbor in SM. This might be interpreted to indicate that they leave the estuary in SM at an age of about 7-8 months. But, fitted CPUE splines for EJ-Red Drum during WN, SP, and SM indicate they were most abundant at salinities < 10 ‰. A possible alternative might be that they moved upriver. But, no Red Drum were taken by FIM in the middle section of the Peace River upstream (Call et al. 2011). The most likely explanation is that faster growing Red Drum grew out of the early-juvenile size range becoming juveniles. The literature indicates that juvenile Red Drum remain in the estuary for about 3 years before spawning in the Gulf of Mexico (Patillo et al. 1997).

The scientific literature for EJ-Spot states that they move up into low salinity headwater areas and may ascend brackish to freshwater during SP and SM (Hildebrand and Cable 1930, Patillo et al. 1997). Killam et al. (1992) found that the spawning season in the Gulf of Mexico near Tampa Bay was during FL and WN. The HSM maps in the present study indicate that EJ-Spot were most abundant in the Lower Peace River in Upper P and Lower P sections in WN. They were also abundant (High zone in HSM map) in shoreline areas of Charlotte Harbor associated with SAV. In SP, the Optimum zone shifts upstream to the Upper P section of the Lower Peace River, with High abundance further downstream in the river and in Charlotte Harbor. In SM, there were almost no Spot present either in the river or in Charlotte Harbor. The HSM maps for SM shows a small area being Optimum at the mouth of the estuary. The same situation was found in FL, with small areas of High and Optimum HSM zones near the mouth of the estuary in

Gasparilla Sound. This indicates that EJ-Spot left Charlotte Harbor in SM and in FL starting at an age of about 6 months.

The fitted splines for EJ-Spot (Figure 4) are of interest. During WN, the CPUE spline peaks at about 7 ‰ accounting for their Optimum abundance in the Lower Peace River. But, the fitted spline is quite broad and can also account for their High abundance in Charlotte Harbor. In SP, the spline agrees with the HSM map in showing Optimum abundance in the Upper P section of the river. In SM, the CPUE spline declines from 0 to 10‰, then increases from 20 to 35 ‰. This is consistent with the HSM map in indicating some EJ-Spot were present in the river at low salinities, with the rest present near the mouth of the estuary where high salinities are found. In FL, the spline shows a marked affinity for salinities >30 ‰, which is consistent with the interpretation that Spot move out of the estuary to spawn (Patillo et al. 1997). Spot mature at 1 or 2 years of age. Monthly length frequencies of EJ-Spot caught in Tampa Bay during 1958 indicted spawning occurred from January through March (Springer and Woodburn 1960). The present findings indicate that Spot left Charlotte Harbor starting in SM. This is earlier than other studies which found Spot leave estuaries in the Gulf of Mexico in FL and WN (LeBlanc et al. 1991, Patillo et al. 1997). Based on data from Cedar Key and Tampa Bay, Springer and Woodburn (1960) stated that most Spot in our area probably migrate offshore in late SM.

Summary

The present study employed new statistical models (Delta-gamma GAM and Delta-beta GAM) to relate the abundance (GC-CPUEs) of species life-stages to environmental variables in Charlotte Harbor and the Lower Peace River. The back-transformed GC-CPUE splines show affinities of each species for low to moderate salinities. Likewise, the statistical tables derived from the Reduced Delta-type GAMs show that salinity is highly significant for the selected species life-stages during most seasons of the year.

By linking the models derived from FIM data with interpolated habitat grids, we were able to create predicted GC-CPUE grids and predicted HSM grids for 32-species life-stages. The HSM maps created by partitioning the continuous grid using natural breaks in the GIS show species were most abundant in the Lower Peace River during most seasons.

A new method for estimating population abundances of species life-stages within estuaries is presented derived from fish-habitat relationships. The population estimates represent the long-term average abundances from 1996 to 2013. These methods present a new approach to support the management of estuaries and management of fish and invertebrate species based on habitat suitability modeling.

These methods will be helpful during the next two phases of the study. Salinity and temperature conditions will be predicted using hydrologic modeling during each season. Delta-type GAMs will be applied to predict the impacts of water withdrawals during each season of the year. The research to date indicates that the goals set by the study can be met to support water management by the SWFWMD in the Lower Peace River and Charlotte Harbor.

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Table 1. Statistical significance of factors determined from Delta-type GAMs for species life-stages in the Lower Peace River and Charlotte Harbor (P≤0.0001=***, P≤0.001=**, P≤0.05=*, P>0.05 and P≤0.10=ns (non-significant), blank spaces=factors not in models.

	J-Bay Anchovy				A-Bay Anchovy				JA-Blue Crab				JA-Hogchoker			
	FL	SM	SP	WN	FL	SM	SP	WN	FL	SM	SP	WN	FL	SM	SP	WN
MU																
sal	***	***	***	ns	***	***	***	ns	***	***	***	***	***	***	***	***
tem			ns	ns				ns	***	**	***	ns	*	***	*	ns
do	***	**			***	**		ns	ns	**	ns		***	***	*	***
dep	ns	***	*	ns	ns	***	*	ns	***	***	**	*	ns		ns	
bc2-Mud	ns	ns	ns	ns	ns	**	ns	ns	***	*	ns	***	ns	***	ns	ns
bc3-SAV	*	ns	***	ns	*	ns	***	ns	ns	ns	ns	ns	ns	*	ns	ns
NU																
sal	***	ns	***	***	***	**	***	***	***	***	***	***	***	***	***	***
tem	**	*	ns		**	*	ns	**	*	**	ns		ns	*	**	ns
do		***		ns		***		ns				*		*		***
dep	ns	***	***	***	ns	*	***	*	***	ns	ns	***	ns		ns	ns
bc2-Mud	*	ns	ns	ns	*	ns	ns	ns	ns	ns	**	ns	ns	ns	***	***
bc3-SAV	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	***	***	*	ns
	EJ-Red Drum				EJ-Kingfish				EJ-Spot				J-Sand Seatrout			
	FL	SM	SP	WN	FL	SM	SP	WN	FL	SM	SP	WN	FL	SM	SP	WN
MU																
sal	**	ns		***	***	ns	***	**	***	**	***	ns	***	***	*	***
tem	*	ns	**	ns		ns		ns	**		***	ns	**	ns	*	*
do	*		ns	ns	***		ns	ns	***	***					***	
dep	**			ns		ns	ns	*			ns	**	**	**		***
bc2-Mud	ns	ns	*	ns	ns	ns	ns	ns	ns	ns	ns	***	ns	ns	***	ns
bc3-SAV	*	ns	*	ns	ns	ns	***	ns	***	**	*	*	ns	**	ns	ns
NU																
sal	ns	***	*	***	ns	ns	***	ns	*	**	***	***	***	**	***	***
tem	ns			ns	**		***	ns	**	*		*	ns	ns	***	ns
do	ns			**				ns		ns	**	**		ns		ns
dep	***		***	*		**				ns	ns	ns	ns	ns		**
bc2-Mud	ns	*	ns	ns	**	*	ns	***	ns	ns	ns	ns	**	ns	***	*
bc3-SAV	**	ns	ns	ns		ns	***	ns	ns	*	ns	**	ns	**	ns	ns

Table 2. Total population numbers estimated from predicted CPUE grids for species life-stages in Lower Peace River and Charlotte Harbor.

Species	Life-Stage	Pop. No. FL	Pop. No. WN	Pop. No. SP	Pop. No. SM
Bay Anchovy	J	1,012,592,531	543,545,810	2,026,871,211	2,526,839,520
Bay Anchovy	A	1,042,157,961	608,047,534	2,472,716,149	2,472,716,149
Blue Crab	JA	1,255,210	3,518,104	1,126,318	922,982
Hogchoker	JA	4,230,653	2,292,318	1,991,242	1,918,031
Sand Seatrout	J	2,657,873	101,712	530,520	5,102,583
Southern Kingfish	EJ	1,377,711	198,898	2,600,069	2,750,188
Red Drum	EJ	9,287,328	2,047,001	256,233	59,850
Spot	EJ	27,744	56,666,438	1,726,166	323,991

Table 3. Seasonal percent of area by HSM zones in Lower Peace River and Charlotte Harbor for predicted grids partitioned by equal areas (EA), equal intervals (EI) and natural breaks (NB).

Species	Life-Stage	HSM Zone	Fall EA	Fall EI	Fall NB	Winter EA	Winter EI	Winter NB	Spring EA	Spring EI	Spring NB	Summer EA	Summer EI	Summer NB
Bay Anchovy	J	L	25	77	60	26	80	68	25	76	55	25	66	49
		M	25	14	22	24	11	19	25	13	25	25	26	22
		H	25	7	11	25	5	8	25	7	12	25	7	21
		O	25	2	8	25	3	5	25	5	9	25	1	8
Bay Anchovy	A	L	26	78	62	25	82	64	25	76	55	25	72	51
		M	24	14	21	24	11	23	25	13	25	25	23	21
		H	25	7	10	24	5	8	25	7	12	25	4	19
		O	25	2	7	24	3	5	25	5	9	25	<1	9
Blue Crab	JA	L	26	96	67	26	83	64	26	92	80	25	87	60
		M	25	4	19	25	10	21	25	6	13	25	11	27
		H	25	<1	10	25	4	9	24	1	6	25	2	10
		O	25	<1	4	25	3	6	25	1	2	25	<1	3
Hogchoker	JA	L	30	99	89	34	99	93	29	99	98	27	94	92
		M	20	1	8	18	1	5	22	1	1	24	3	4
		H	26	<1	2	23	<1	1	24	<1	1	24	3	2
		O	24	<1	1	25	<1	1	25	<1	<1	25	<1	2
Sand Seatrout	J	L	29	99	87	28	100	82	29	99	89	26	85	60
		M	26	1	8	25	<1	17	23	1	8	25	15	14
		H	21	<1	4	22	<1	1	24	<1	2	24	<1	18
		O	25	<1	1	24	<1	<1	24	<1	1	25	<1	9
Southern Kingfish	EJ	L	25	82	60	25	85	47	27	91	86	26	76	63
		M	25	11	24	25	14	30	25	6	8	25	13	20
		H	25	6	9	25	1	19	24	2	5	25	9	14
		O	25	1	6	25	<1	3	25	<1	1	25	2	3
Red Drum	EJ	L	27	78	62	25	98	75	26	88	52	25	93	70
		M	23	17	14	25	2	18	25	11	26	25	5	24
		H	25	5	15	25	<1	6	25	<1	15	25	1	5
		O	25	<1	9	25	<1	1	25	<1	7	25	1	1
Spot	EJ	L	27	100	92	27	100	100	25	81	44	28	99	69
		M	24	<1	7	26	<1	<1	25	17	28	23	1	28
		H	24	<1	1	24	<1	<1	25	1	24	24	<1	3
		O	25	<1	<1	24	<1	<1	25	<1	4	25	<1	1

Table 4. Seasonal percent of population numbers and percent confidence intervals estimated for species life-stages by HSM zones (L=Low, M=Moderate, H=High, O=Optimum) partitioned using natural breaks.

Species	Life-Stage	HSM Zone	% Pop. No. FL	% Pop. No. WN	% Pop. No. SP	% Pop. No. SM	± CI % FL	± CI % WN	± CI % SP	± CI % SM
Bay Anchovy	J	L	19	19	12	9	5	7	8	10
		M	26	28	25	23	4	4	4	4
		H	26	27	27	42	4	4	4	2
		O	30	26	36	26	4	4	3	4
Bay Anchovy	A	L	20	21	10	10	5	6	8	9
		M	25	30	22	22	8	4	4	4
		H	25	23	38	38	4	4	4	3
		O	29	26	30	30	4	4	3	4
Blue Crab	JA	L	21	24	40	36	7	4	4	3
		M	28	25	22	32	4	4	6	3
		H	31	22	24	21	4	5	6	4
		O	20	28	14	11	8	3	10	6
Hogchoker	JA	L	37	33	67	28	7	8	7	10
		M	22	25	10	19	10	11	16	11
		H	20	17	11	24	13	18	16	6
		O	21	25	13	29	18	17	16	5
Sand Seatrout	J	L	26	35	38	12	10	7	7	8
		M	27	52	28	14	8	5	10	6
		H	33	9	21	43	9	27	13	2
		O	13	4	13	30	23	55	24	4
Southern Kingfish	EJ	L	15	15	23	18	8	6	10	7
		M	30	32	29	27	4	3	7	4
		H	26	39	41	41	4	3	5	3
		O	29	13	7	13	4	8	11	5
Red Drum	EJ	L	5	41	24	30	6	3	6	6
		M	16	31	26	43	3	4	3	4
		H	39	20	28	17	3	5	3	6
		O	40	9	22	10	8	15	5	10
Spot	EJ	L	62	10	34	91	5	8	4	4
		M	28	28	47	2	10	3	4	53
		H	8	48	12	3	27	2	12	41
		O	3	13	7	3	36	7	20	20

Table 5. Seasonal ranges and mean salinities for Optimum zones of species life-stages in Lower Peace River and Charlotte Harbor.				
Species life-stage	**Season**	**Min ‰**	**Max ‰**	**Mean ‰**
JA-Hogchoker	FL	0.02	3.00	0.81
JA-Hogchoker	WN	0.40	5.40	1.27
JA-Hogchoker	SP	0.44	3.01	1.51
JA-Hogchoker	SM	0.16	3.96	0.70
J-Sand Seatrout	FL	0.02	16.65	5.80
J-Sand Seatrout	WN	1.63	18.50	4.81
J-Sand Seatrout	SP	1.71	11.18	6.59
J-Sand Seatrout	SM	0.15	21.44	10.08
JA-Blue Crab	FL	0.02	23.97	10.64
JA-Blue Crab	WN	3.51	23.40	13.84
JA-Blue Crab	SP	2.82	19.15	7.85
JA-Blue Crab	SM	0.15	14.25	2.35
EJ-Southern Kingfish	FL	7.81	22.82	15.98
EJ-Southern Kingfish	WN	0.48	28.24	22.52
EJ-Southern Kingfish	SP	14.08	22.66	18.68
EJ-Southern Kingfish	SM	8.52	20.12	14.16
J-Bay Anchovy	FL	6.67	26.05	17.84
J-Bay Anchovy	WN	6.11	25.24	15.89
J-Bay Anchovy	SP	5.96	28.58	21.07
J-Bay Anchovy	SM	7.17	29.19	20.00
A-Bay Anchovy	FL	6.69	26.05	17.88
A-Bay Anchovy	WN	5.13	25.41	15.44
A-Bay Anchovy	SP	5.96	28.58	21.07
A-Bay Anchovy	SM	7.16	29.92	20.82
EJ-Red Drum	FL	9.55	36.01	25.12
EJ-Red Drum	WN	0.40	16.32	4.78
EJ-Red Drum	SP	0.44	36.49	28.92
EJ-Red Drum	SM	1.60	12.12	7.57
EJ-Spot	FL	34.43	35.66	35.30
EJ-Spot	WN	0.95	35.03	13.50
EJ-Spot	SP	0.44	7.58	2.38
EJ-Spot	SM	31.41	32.40	31.88

Table 6. Seasonal verification scores for mean CPUEs versus HSM zones associated with Equal Areas, Equal Intervals and Natural Breaks. Increasing across four zones=1, Increasing across two or three zones=0.5 and not increasing across zones=0.

Species life-stage	EI FL	EI WN	EI SP	EI SM	EA FL	EA WN	EA SP	EA SM	NB FL	NB WN	NB SP	NB SM
J-Bay Anchovy	1	1	1	0.5	1	1	1	1	1	1	1	1
A-Bay Anchovy	1	0	1	1	1	1	1	1	1	1	1	1
JA-Hogchoker	0.5	1	1	0	1	1	1	1	1	1	1	1
JA-Blue Crab	0.5	1	1	1	1	1	1	1	1	1	1	1
J-Sand Seatrout	0	0	0	0	1	1	1	1	1	1	1	0
EJ-Southern Kingfish	1	1	1	1	1	1	1	1	1	1	1	1
EJ-Red Drum	1	1	0.5	0.5	1	1	1	1	1	1	1	1
EJ-Spot	0.5	0.5	0	1	0.5	1	1	1	0.5	0.5	1	1
TOTALS	5.5	5.5	5.5	5	7.5	8	8	8	7.5	7.5	8	7

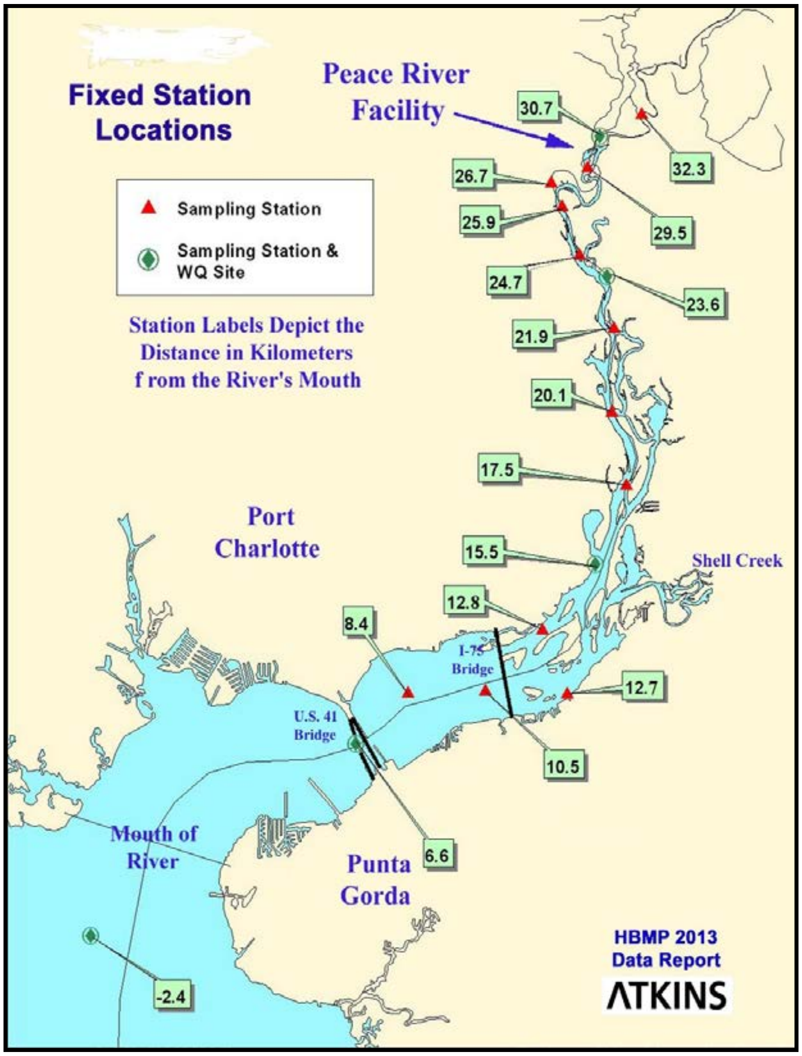

Figure 1. Station locations for data recorders (red triangles) based on distance from the mouth of the Lower Peace River.

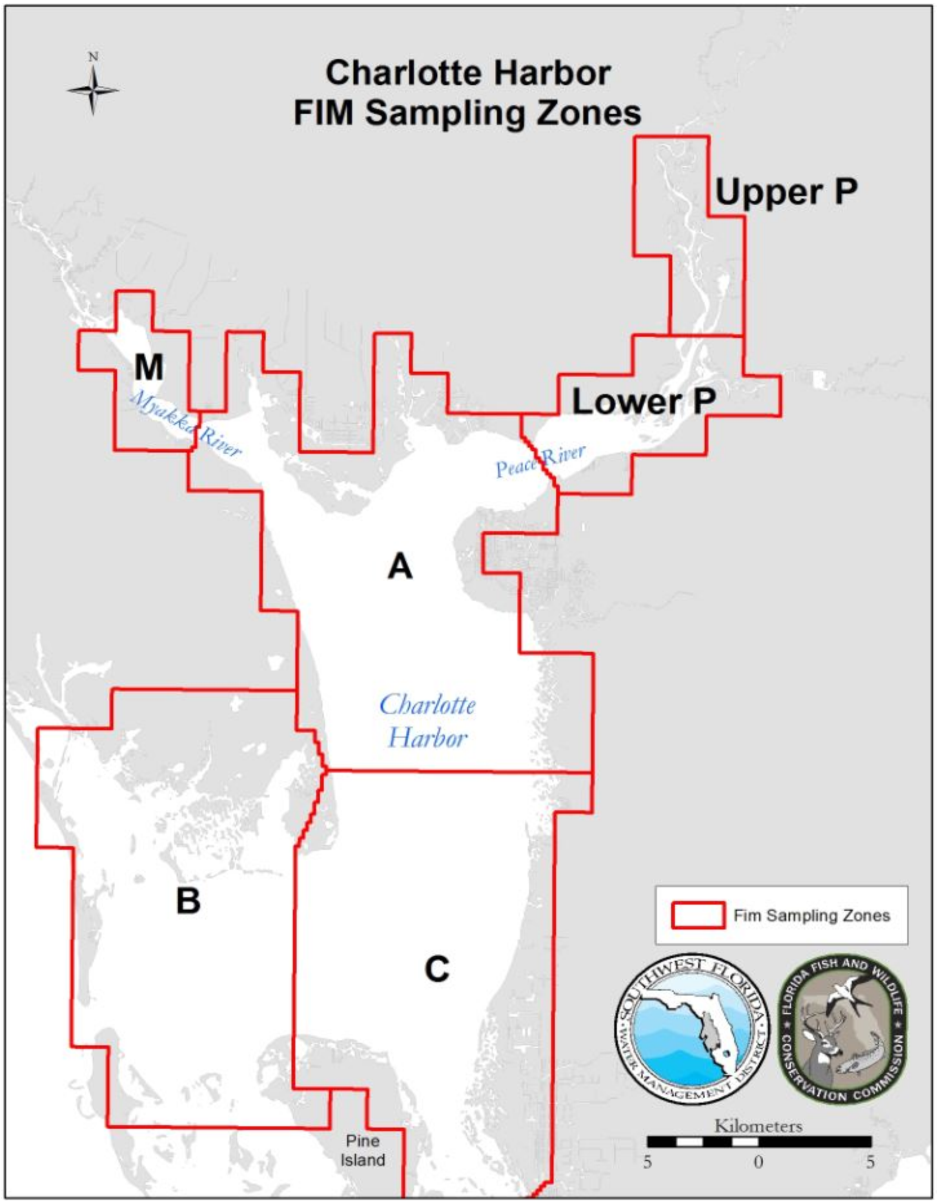

Figure 2. FIM sampling sub-regions in Charlotte Harbor and Lower Peace River. The sub-region designated Upper P is the area associated with special studies.

Deleted: zones

Deleted: zone

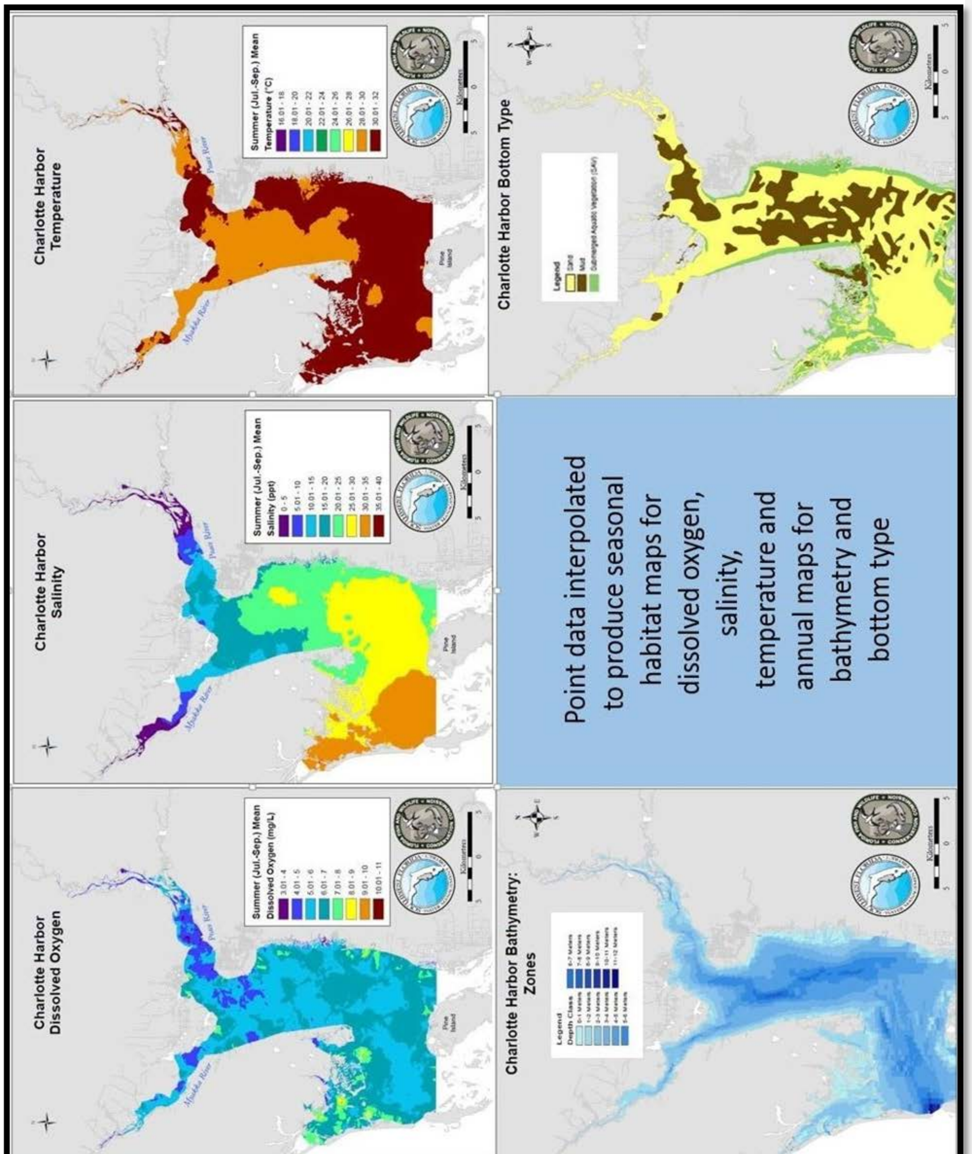

Figure 3. Maps created for dissolved oxygen, salinity and temperature during summer and annual maps for bathymetry and bottom type in Charlotte Harbor.

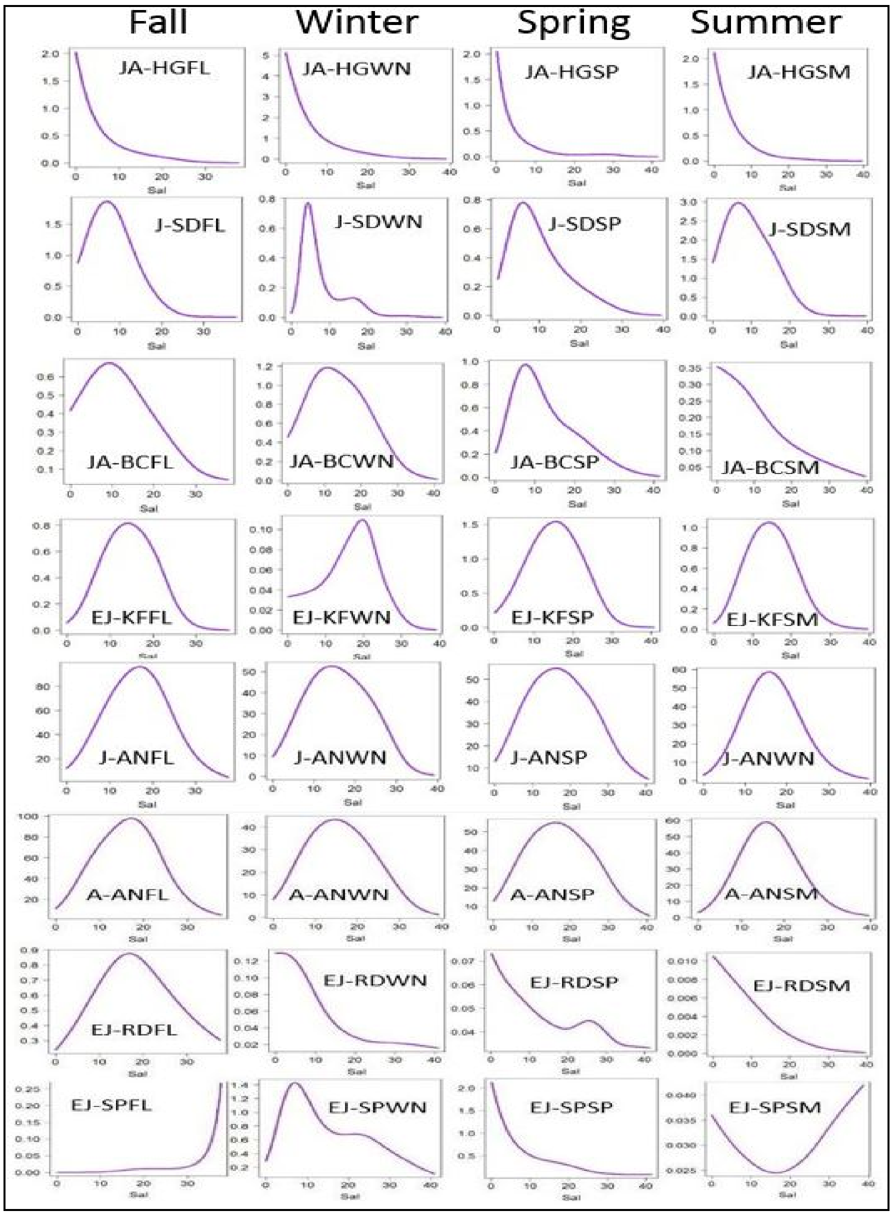

Figure 4. Seasonal fitted splines for back-transformed CPUEs by salinity. HG=Hogchoker, SD=Sand Seatrout, BC=Blue Crab, KF=Southern Kingfish, AN=Bay Anchovy, RD=Red Drum, SP=Spot.

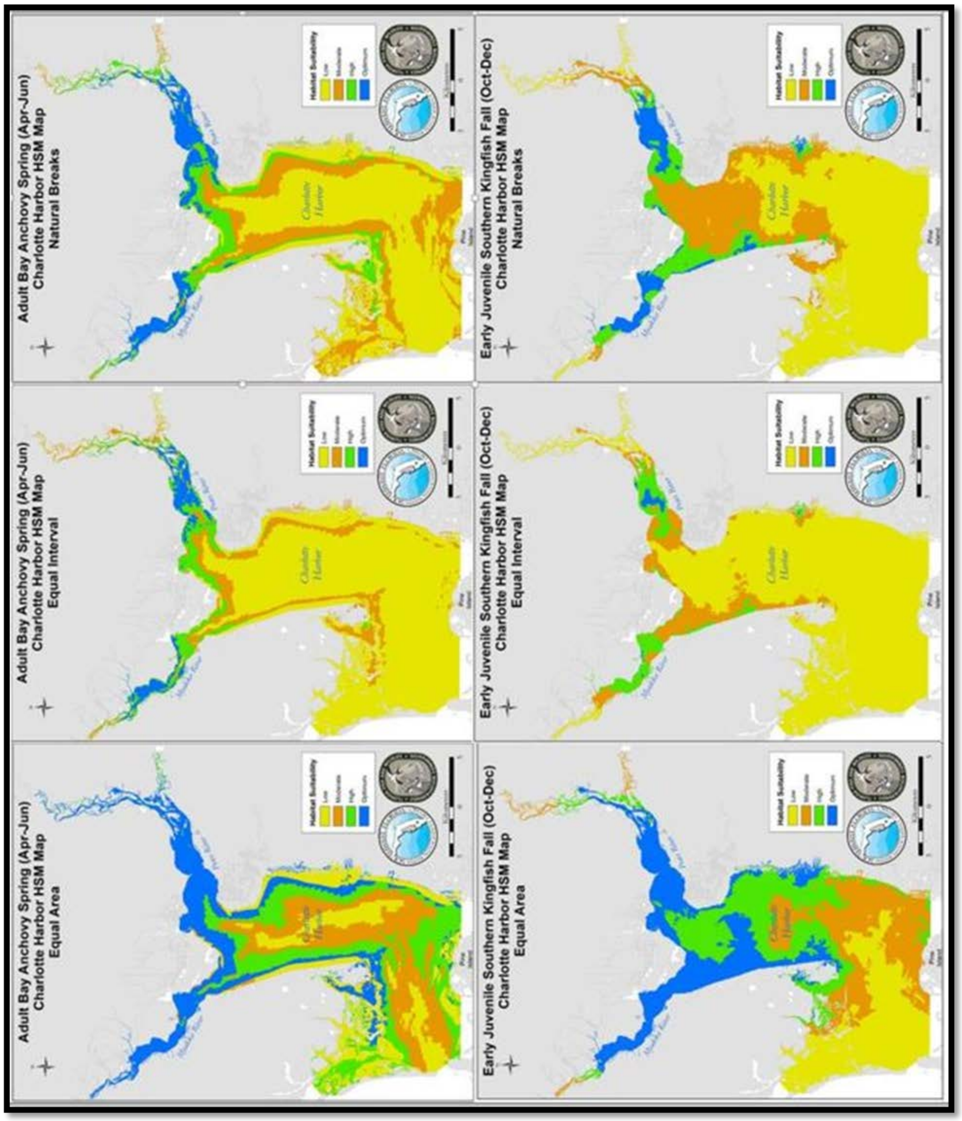

Figure 5. HSM maps for adult Bay Anchovy and early-juvenile Southern Kingfish showing the areas occupied by Optimal zones based on equal areas, equal intervals and natural breaks.

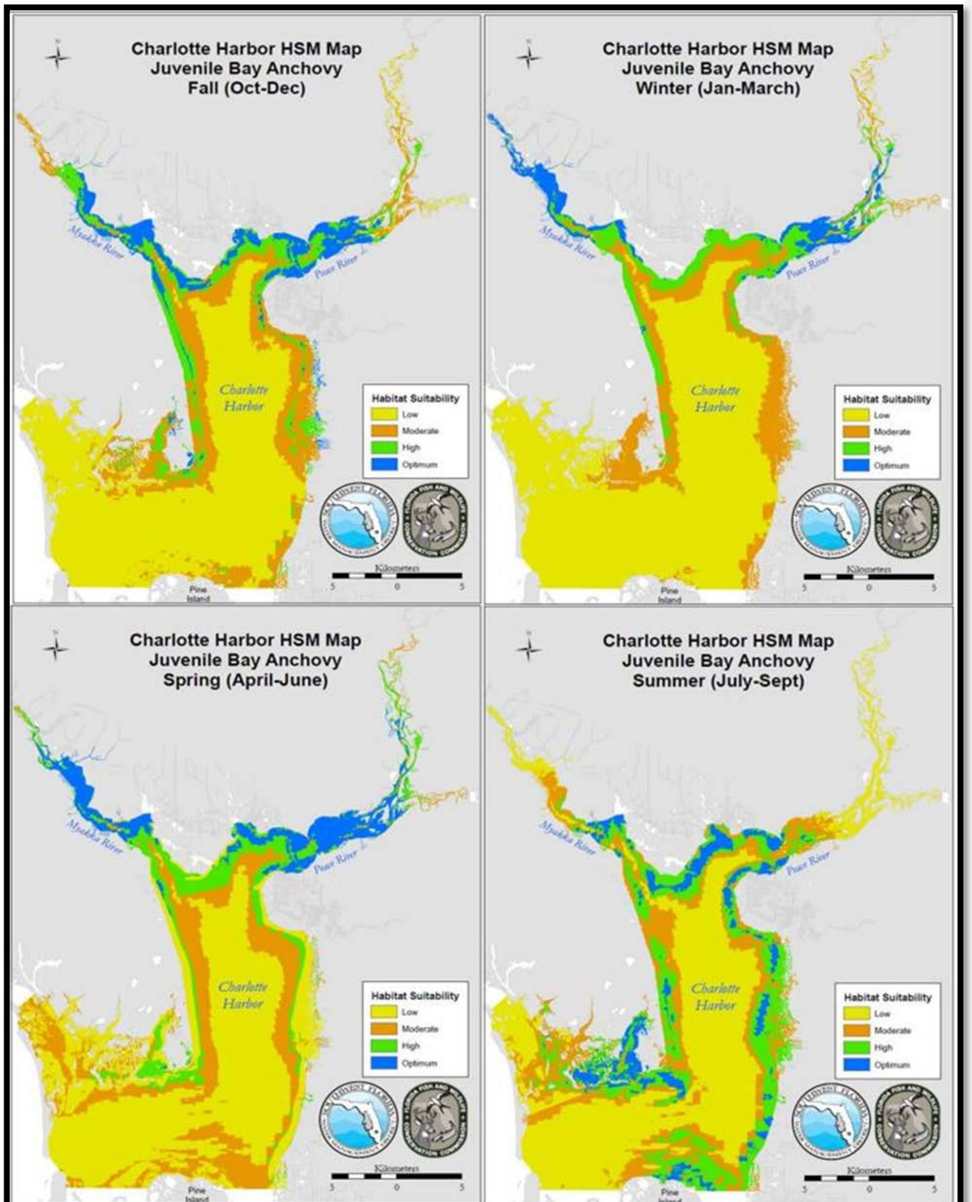

Figure 6. HSM maps for juvenile Bay Anchovy depicting changes in Optimum zones between seasons.

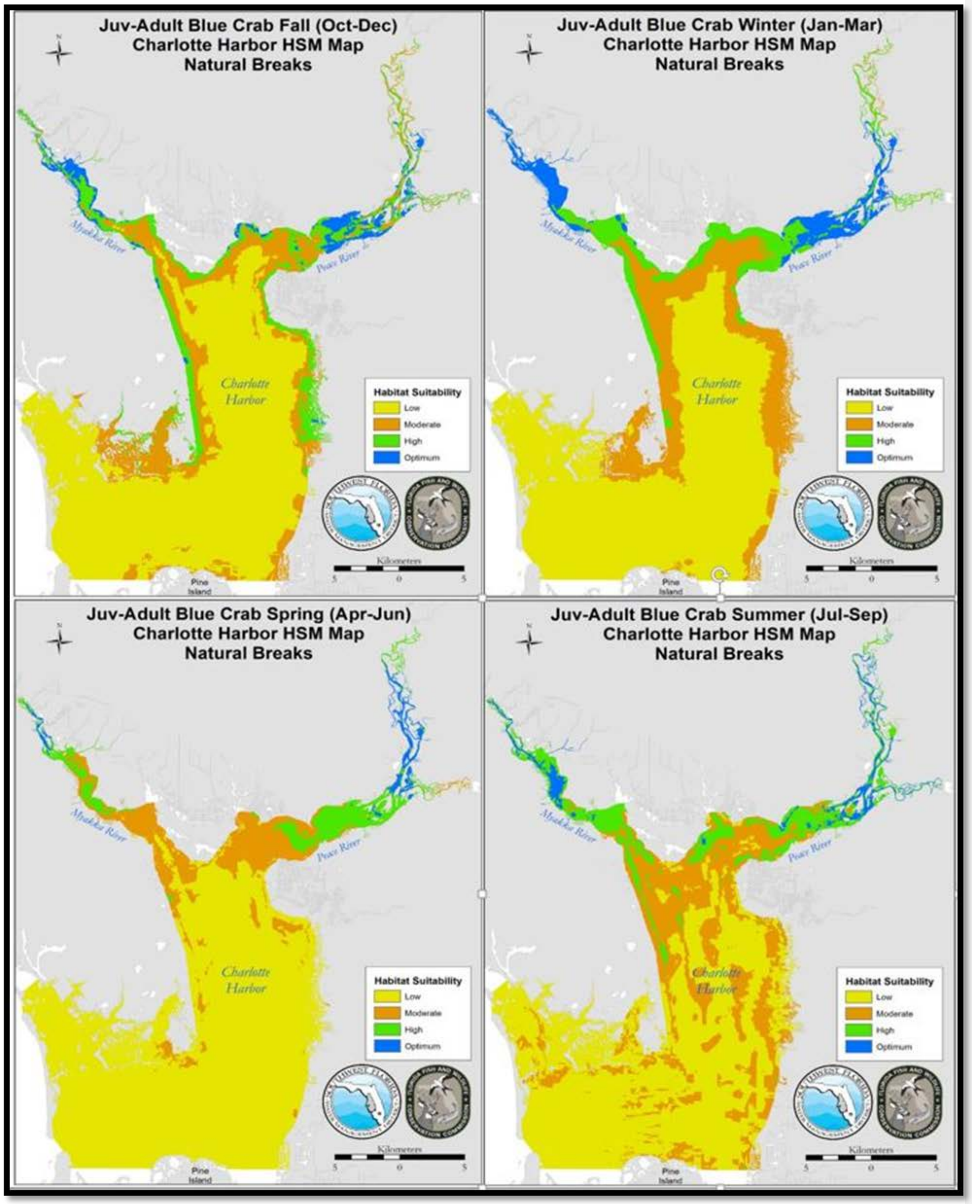

Figure 7. HSM maps for juvenile-adult Blue Crab depicting changes in Optimum zones between seasons.

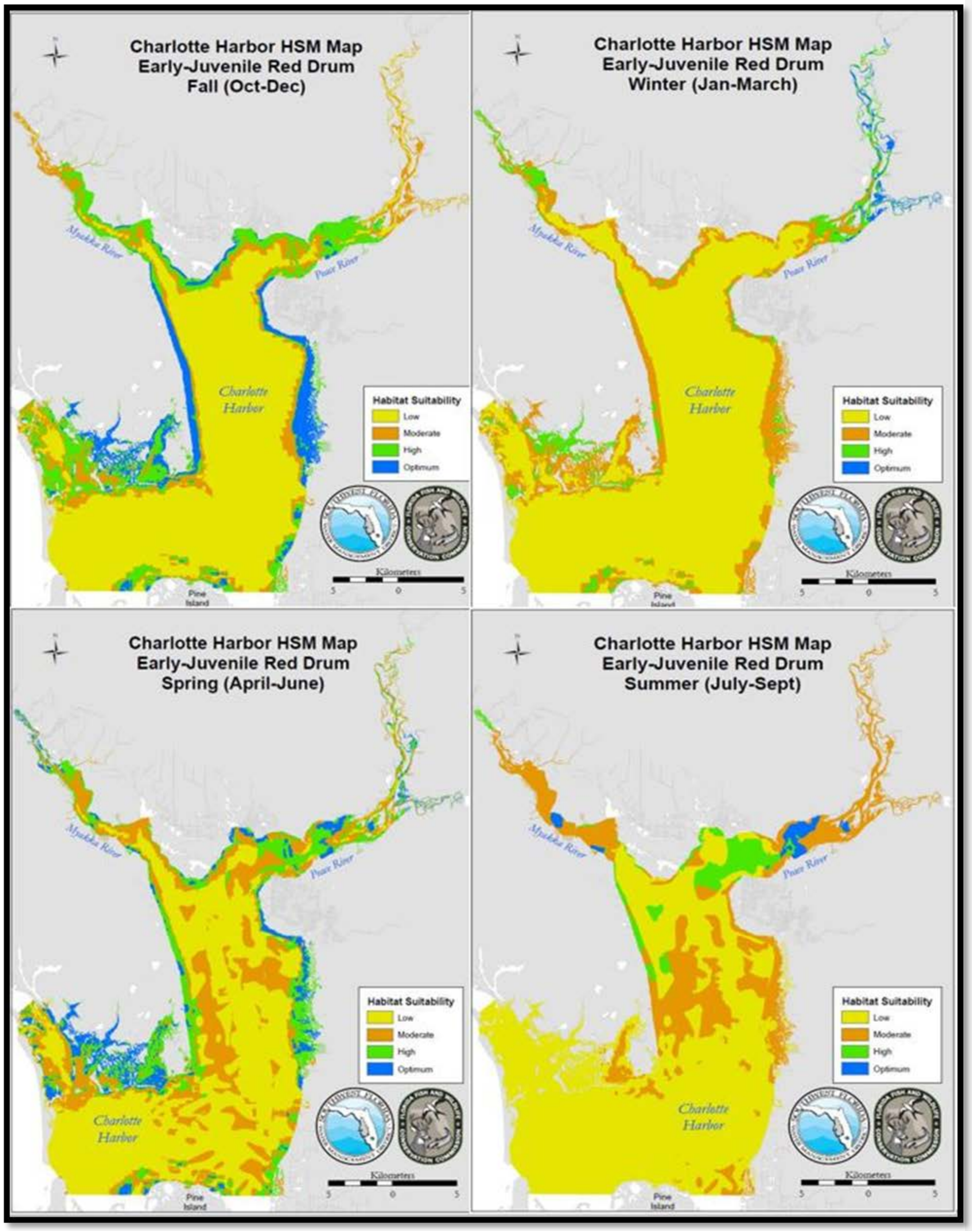

Figure 8. HSM maps for early-juvenile Red Drum depicting changes in Optimum zones between seasons.

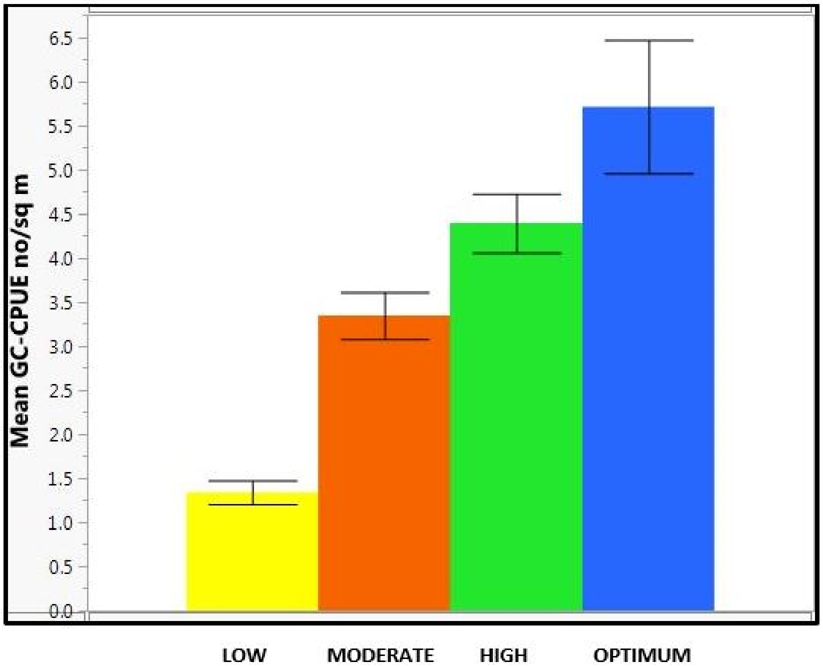

Figure 9. Verification graph for adult Bay Anchovy in fall with mean GC-CPUEs plotted versus HSM zones based on natural breaks along with 95% confidence intervals.

From:	Sid Flannery
To:	Doug Leeper; Eric DeHaven; Sky Notestein
Subject:	Rainbow Rule, FFWCC draft manuscript and Lower Hillsborough data
Date:	Thursday, May 24, 2018 11:18:25 AM
Attachments:	Comptons Dock - bottom conductivity and DO.pdf

Hello Eric, Doug and Sky,

I told Eric I would be working on revised rule language for the Rainbow River, but I got delayed about a week. Peter Rubec of FFWCC sent me the draft of a journal manuscript to review that is based on his project for the District that uses Habitat Suitability Modeling to estimate fish and blue crab populations in the Lower Peace River and Charlotte Harbor. I know he has submitted his final report to you.

I gave Peter the most detailed review of the draft he has received and he incorporated most of my changes. I think the paper is pretty good and hope it gets published. It makes the District look good as you are doing new innovative techniques to establish minimum flows. Having said that, the paper only mentions minimum flows and does not show simulations of any proposed minimum flows. Instead, it is more of a techniques oriented paper and uses average flows in four seasons to predict fish distribution and abundance.

So, I will be getting on the Rainbow rule language issue soon, actually starting tomorrow. I hope to make good progress in the next two weeks. Please keep me posted if the District wants to adopt a permanent minimum flow rule very soon.

In the mean time, how bout these unseasonal rains and flows we are getting. Definitely helping both water supplies and minimum flows and levels. It is a good thing the data collection for analysis on the Lower Hillsborough River got extended to the end of May, but the data near the end of the month will not be under minimum flows due to the unusually high rainfall and flows, which resumed at the dam on Monday.

However, the data in the first half of May are very valuable. See the attached pdf of specific conductance and dissolved oxygen at the USGS recorder at Compton's dock. It is clear that when high conductivity water moves up to that location, hypoxia and anoxia occurs. Under a longer dry season with prolonged minimum flows, you would see that increasing.

Have a fine weekend,

Sid

From: Sid Flannery
To: Yonas Ghile; Xinjian Chen; Doug Leeper
Subject: First to two emails on Lower Peace River stuff
Date: Wednesday, October 18, 2017 9:06:55 AM
Attachments: Peace River workshop summary comments.pdf

Hello Yonas, Xinjian and Doug,

This is the first of two emails I will send this morning about stuff you probably already know, but is carry over from my days at the Big D.

This email pertains to a stakeholder workshop the District held on March 7, 2013 about the Lower Peace River minimum flows reevaluation. I recall that Xinjian and I and several others gave power point presentations at the meeting, which was held at the District's Sarasota office.

We also received written comments from attendees at the meeting and prepared a meeting summary, which is attached to this email. This summary does not imply the District has to necessarily follow these suggestions, but it was input we received. Other files related to this workshop, are in a folder that I left on my D drive in Rivers/PeaceLower/2013 workshop.

I will send a second email in a moment about updated regressions for the location of the chlorophyll *a* maximum and the distribution and abundance of selected fish and invertebrates in the Lower Peace River.

Best wishes and hope all is going well,

Sid

Summary of Major Comments and Discussion Topics
Lower Peace River Minimum Flows Workshop, March 7, 2013

The paragraphs below summarize major points that were raised in discussions at the workshop for the re-evaluation of minimum flows for the Lower Peace River that was held at the SWFWMD Sarasota office on March 7, 2013. Power Point presentations that were shown at the workshop were distributed separately and are not summarized below. Similarly, written comments submitted to the District were distributed separately and are not summarized below.

Summary of workshop discussions

- It was emphasized that large reductions in high flows could affect habitats further downstream in the harbor, which was not accounted for in the first minimum flows analysis. The new minimum flows analysis should account for changes in habitats in the main body of the harbor, especially at high flows. It was questioned that a 38% reduction in flow would cause a smaller change in salinity zone habitats further downstream.

- It was emphasized that the accuracy of the salinity predictions generated by the District's hydrodynamic model should be further examined and confidence limits around the statistics that are generated from the model output should be determined. This would help determine how limits to the accuracy of the tools that are employed could result in unintended consequences from the proposed minimum flows.

- The use of seasonal blocks was questioned, and it was suggested that a single percent flow reduction number might be better. Similarly, the use of seasonal blocks that were based solely on freshwater streamflow records was also questioned.

  It was asked that if some seasonal factors that are important to estuarine resources could be incorporated in the determination of seasonal blocks. Such factors could include factors related to primary production or juvenile fish recruitment to the estuary. Flows in the beginning of the spring should be protected to maintain nutrient loading rates that drive primary production in the spring.

- The high habitat utilization of mangroves along the eastern wall by juvenile fishes was mentioned to emphasize that the minimum flows analysis should be extended to include habitats beyond the mouth of the river. It was discussed that the model does not extend into the mangrove creeks and islands, but the changes in the salinity of cells adjacent to those zones could be simulated, especially at high flows.

- It was suggested that certain bars and other bottom features in the harbor that could affect circulation may not be picked up by the model grid. It was discussed that the model grid could be modified to account for such bottom features.

- The need for a inflow budget to Charlotte Harbor was discussed. The District said it could calculate a total inflow budget for the harbor and the relative effect of flow reductions resulting from the proposed minimum flows for both the Peace and Myakka Rivers.

- The need to consider the effects of flows from the Myakka River on salinity in the Peace River, and vice versa, was discussed. The District said that simulations could be run in which flows from the both the Peace and Myakka were reduced by the corresponding minimum flow rules. The District will have to update the amount of excess flow in the Myakka River that can be removed.

- The regression approach that Mote Marine took for predicting the locations of isohalines in the Myakka River was discussed, including the different explanatory variables that were employed to account for short and long term changes in flows and the volume of water in the river where each isohaline was located.

- Seasonal changes in sea level were discussed with regard to the inundation of tidal marshes, and the effects of long-term (19-year) cycles in astronomical tides was discussed. The District model can adjust tides to conditions that are desired for simulation.

- The potential effects of sea level rise were discussed. The District has not yet committed yet to running scenarios that account for sea level rise, but the model is capable of doing such simulations.

- It was questioned if the District could account for shifts in the seasonal rainfall patterns. That would be difficult because it would have to be manifested in changes in flows and those would be difficult to predict

- It was suggested that day length could be incorporated into the primary production study. Mote has solar insolation data that can be made available for the primary production study.

- Questions were raised about the availability of phytoplankton species composition data. The District replied that USF has done a prior study that compared data from the Peace, Little Manatee, and Alafia.

- It was suggested the District keep track of the status of the establishment of numeric nutrient criteria for the Peace River and changes in the FDEP dissolved oxygen criteria. The District should take into account organisms that are either tolerant or intolerant of DO sags. The role of temperature in the formation of hypoxia should be accounted for.

- The District's 15% loss of habitat for identifying significant harm was questioned. What is the basis for this threshold - could other thresholds be established or defended?

- It was suggested that the District identify and classify the wetlands communities that could be affected by changes in inundation. The District confirmed it can do so.

- The St. Johns River minimum flows studies could be examined as examples of studies that looked at floodplain inundation as a minimum flow criterion

- All power point presentations shown at the meeting will be distributed in a pdf file to the group.

- Workshop members were encouraged to submit any additional comments to the District regarding other data or relationships that should be examined or analytical techniques that should be pursued

From:	Sid Flannery
To:	Yonas Ghile; Doug Leeper; Xinjian Chen
Subject:	Reports with updated Lower Peace River regressions
Date:	Wednesday, October 18, 2017 9:09:06 AM

Hello again,

I expect you are aware of what this email describes, but I thought I would send it anyway, especially because of the updated Peebles (2013) report for the Lower Peace River and Shell Creek.

The District's 2010 minimum flows report for the Lower Peace River presented results for predicted shifts in the chlorophyll *a* maximum and the distribution and abundance for six fish and invertebrate species (See Section 8.6 on pages 8-14 and 8-15 of the minimum flows report). The minimum flows were not based on these predictions, but they were used as checks to test the effects of the minimum flows on other ecological parameters.

The equations for those predictions have been updated based on reports that were completed for the District after the 2010 minimum flows report was published A new equation to predict the location of the chlorophyll *a* maximum is presented in the report - *Atkins, Inc. (2014). An analysis of relationships of freshwater inflow and nutrient loading with chlorophyll values and primary production rates in the Lower Peace River. Report prepared for the Southwest Florida Water Management District.*

This report was submitted about a month before I retired and I did not have a chance to review it, but I trusted it was good. However, it does not have a table of contents nor an executive summary. If you like, I could prepare those sometime before Christmas and they could be added to the report.

The fish and invertebrate regressions for the plankton catch data were revised by Peebles, beyond those presented in his 2002 report that were used in the 2010 minimum flows report. Because his initial study was conducted during a fairly wet period, the District funded an additional five months of data collection in a dry period between February and June, 2008. The regressions were then rerun using this expanded data base.

Those regressions and updated catch statistics are presented in the report - *Peebles and Burghart. (2013). Database amendment and analysis update for plankton-net surveys of the Lower Peace River and Shell Creek estuaries, including revised regressions for distribution and abundance responses. Report of the University of South Florida College of Marine Science for the Southwest Florida Water Management District.*

Both of the reports above should be in the District's library holdings and also in a folder I left behind that contains various reports. The regressions to predict the distribution and abundance of nekton by Greenwood et al. (2004) were not updated.

Again, you probably already know this, but I hope this helps,

Sid

From:	Doug Leeper
To:	Cheryl Glenn
Cc:	Sky Notestein; Gabe I. Herrick
Subject:	RE: MFL Questions
Date:	Thursday, October 26, 2017 2:03:00 PM
Attachments:	SWFWMD 2015-Intial reevaluation of the MFLs for the LPR.pdf SWFWMD 2015-09 Gov Bd - Lower Peace River Inititial Reevaluation.pdf

Hey Cheryl – I've imbedded responses in your email below.

Doug Leeper

From: Cheryl Glenn
Sent: Thursday, October 26, 2017 11:57 AM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: MFL Questions

Doug,

I have the following questions regarding rivers based on my review of the

1. Peace River lower segment. Were there any changes due to the reeval? Is there a new MFL report? It looks like this is included in the "proposed" list as well as the "adopted" list for 2018.

   Response: No changes to the lower Peace River MFLs were identified as a result of our 2015 reevaluation, which we termed an "initial reevaluation" (the reevaluation report and the associated Governing Board recap are attached). We never posted this initial reevaluation on our MFLs web page, so I don't think we need to change the lower Peace report link in your layer. The old, original MFLs are the ones that are adopted in rule. They have been reevaluated (our initial 2015 reevaluation) once. We are doing a full reevaluation of the lower Peace River that will be completed in 2018 and is expected to result in "new" MFLs that will be described in a yet to be developed report.

2. The following rivers need the date board approved, adopted date, and effective date:
   a. Rainbow River System

      Response: Board approved initiation of rulemaking on 3/28/2017; Board approved initiation of rulemaking and initiation of emergency rulemaking for revised rule language on 6/27/2017; emergency rule adopted 6/29/2017 and effective 6/29/2017.

   b. Crystal River System and King Bay Springs

      Response: Board approved initiation of rulemaking on 5/23/2017; Board approved initiation of rulemaking and initiation of emergency rulemaking for revised rule language on 6/27/2017; emergency rule adopted 6/29/2017 and effective 6/29/2017.

This should be the last of them. Thanks!

Cheryl
****
Cheryl Glenn, GISP
Senior GIS Analyst
Mapping & GIS, Data Collection Bureau
Southwest Florida Water Management District
2379 Broad St., Brooksville, FL 34604
voice: 352-796-7211, ext 4224
fax: 352-754-3484

From:	FootPrintsPRR
To:	Doug Leeper
Subject:	SWFWMD Public Records Request - Debbie Carlisle - de la Parte & Gilbert P.A. - Re-Evaluation of L...
Date:	Monday, April 30, 2018 8:34:34 AM

When replying, type your text above this line.

Notification of Issue Change

The following changes have been made to this Issue: *canRead:agentRoles, Changed Title, Changed Issue data or Contact data, Added CC: doug.leeper@swfwmd.state.fl.us, Added Assignees : Jessica Straton Amissa Smith Karen West, Escalated: Set Start Date & Status, Changed Status to Under 7 days old from NewRequest, Escalated: Send Acknowledgement Email, Escalation email sent: dcarlisle@dgfirm.com, Escalation email sent: footprints.pm@watermatters.org, canRead:allRoles.*

Workspace:	Public Records Request
Issue:	Debbie Carlisle - de la Parte & Gilbert P.A. - Re-Evaluation of Lower Peace River Minimum Flow Public Records Request
Issue Number:	26906

Priority:	Medium	**Status:**	Under 7 days old
Date:	04/30/2018	**Time:**	08:33:41
Creation Date:	04/27/2018	**Creation Time:**	16:51:04
Created By:	dcarlisle@dgfirm.com		

Description:

Entered on 04/27/2018 at 4:51:04 PM EDT (GMT-0400) by dcarlisle@dgfirm.com:
Good Afternoon,

Please see attached letter from Ed de la Parte regarding the above-described matter. The original is to follow via U.S. Mail.

Sincerely,

Debbie Carlisle
Legal Assistant to
Edward P. de la Parte, Jr.,
Nicolas Q. Porter, and
Kristin Y. Melton
de la Parte & Gilbert, P.A.
101 East Kennedy Blvd., Suite 2000
Tampa, Florida 33602
Direct: (813) 676-8567
Office: (813) 229-2775
Fax: (813) 229-2712
dcarlisle@dgfirm.com<blocked::mailto:dcarlisle@dgfirm.com>

you.

Current Assignees: Amissa Smith, Jessica Straton, Karen West, Document Services

CC(s): (permanent) doug.leeper@swfwmd.state.fl.us, EDelaparte@dgfirm.com, karen.west@watermatters.org, kmelton@dgfirm.com, lfoy@dgfirm.com

Issue Information:

Internal Request: Off

Contact Information:

Last Name:	Carlisle	**First Name:**	Debbie
Company:	de la Parte & Gilbert P.A.	**Email Address:**	dcarlisle@dgfirm.com
Phone:	813-676-8567		

Attachments: 18-04-27 EPD PRR to SWFWMD Re-Evaluation of Lower Peace River Minimum Flow (00540537).pdf

de la Parte & Gilbert, P.A.
ATTORNEYS AT LAW

David M. Caldevilla
Edward P. de la Parte, Jr.
Richard A. Gilbert
Donald C. Greiwe

Patrick J. McNamara
Kristin Y. Melton
Nicolas Q. Porter

Louis A. de la Parte, Jr.
Founder (1929-2008)

April 27, 2018

Via Email and U.S. Mail
Mr. Owen T. Thornberry, P.G.
Senior Professional Geologist
Water Use Permit Bureau
Regulation Division
Southwest Florida Water
Management District
7601 U.S. Highway 301 North
Tampa, FL 33637
Owen.Thornberry@watermatters.org

and

Mr. Earl C. Rich
General Services Bureau Chief and
Public Records Custodian
General Services
Southwest Florida Water
Management District
2379 Broad Street
Brooksville, FL 34604
prr@SWFWMD.state.fl.us

Re: **Public Record Request to Southwest Florida Water Management District Re-Evaluation of Lower Peace River Minimum Flow**

Dear Gentlemen,

Pursuant to Section 119.07, Florida Statutes, I request copies of the following documents which are Public Records (as that term is defined in Section 119.011(12), Florida Statutes), in the possession and control of the Southwest Florida Water Management District ("District"), its officials, employees, agents, attorneys and all other persons acting on its behalf:

- All documents relating to the District's pending re-evaluation of the minimum flow for the Lower Peace River, which is described in the District's 2017-2018 Minimum Flows and Levels Priority List and Schedule and Reservations List and Schedule as being completed in 2018, including, but not limited to all documents describing any proposed new or modified minimum flow for the Lower Peace River.

101 East Kennedy Blvd., Suite 2000 | Tampa, Florida 33602
Mailing Address: Post Office Box 2350 | Tampa, Florida 33601-2350
T: (813) 229-2775 F: (813) 229-2712 | www.dgfirm.com

Please note this public record request should be interpreted to include responsive public records contained in the private email accounts or in the text messages of any District official, employee, agent and attorney. The phrase "private email account" means any email account not maintained on mail server owned or controlled by the District. The term "text messages" means any text message sent or received by any District official, employee, agent and attorney from any computer, cellphone, or other type of mobile device with texting capabilities.

Pursuant to Section 119.07(1)(e) and 119.07(1)(f), Florida Statutes, we request you to "state in writing and with particularity" any conclusion that any requested Public Record herein or any portion thereof is exempt from the disclosure requirements of Chapter 119, Florida Statutes. The statement shall include the exemption, which you "contend is applicable to the record, including the statutory citation to an exemption created or afforded by statute." If portions of a document are exempt from disclosure, Section 119.07(1)(d) requires that you "shall redact that portion of the record with respect to which an exemption has been asserted and validly applies, and... shall produce the reminder of such record...."

Please provide my paralegal, Linda Foy, within an estimate of the cost of fulfilling, this request prior to copying any documents. Ms. Foy will contact your office within the next few days for the status of this request. In the meantime, however, if you have questions, please do not hesitate to contact Ms. Foy by email at lfoy@dgfirm.com or by telephone at 813-276-798.

Thank you for your prompt attention to this request.

Sincerely Yours;

de la Parte & Gilbert, P. A.

Edward de la Parte

Edward P. de la Parte, Jr.

cc: Karen West, Esq., General Counsel
SWFWMD

From:	FootPrintsPRR
To:	Doug Leeper
Subject:	SWFWMD Public Records Request - Amy Wells Brennan - Manson Bolves Donaldson Varn - Records Provid...
Date:	Tuesday, May 29, 2018 2:31:05 PM

When replying, type your text above this line.

Notification of Issue Registration

Workspace: Public Records Request
Issue: Amy Wells Brennan - Manson Bolves Donaldson Varn - Records Provided to de la Parte and Gilbert Law Firm for Records Provided Concerning MFLs for the Peace River
Issue Number: 27208

Priority: Medium **Status:** Under 7 days old
Date: 05/29/2018 **Time:** 14:28:55
Created By: Shellie Ferreira-Lee

Description:
Entered on 05/29/2018 at 2:28:54 PM EDT (GMT-0400) by Shellie Ferreira-Lee:

Good afternoon Shellie,

It is my understanding that the Southwest Florida Water Management District recently responded to the law firm of de la Parte & Gilbert regarding a recent public records request it made to the District concerning MFLs for the Peace River. I would like to request copies of whatever documents the District provided in response to that request. It is also my understanding that de la Parte & Gilbert provided a hard drive or other type of storage device to the District in order to respond to that request; we are also willing to provide whatever storage device is necessary. Please let me know what is necessary so that we can make those arrangements.

If you have any questions or concerns, please do not hesitate to contact me.

Thank you,

Amy

Amy Wells Brennan

Attorney

Manson Bolves Donaldson Varn, PA

109 N. Brush Street, Suite 300

Tampa, Florida 33602

(813) 514-4700

ABrennan@mansonbolves.com

Current Assignees: Amissa Smith, Jessica Straton, Karen West, Document Services

CC(s): (this edit only) chris.tumminia@swfwmd.state.fl.us, doug.leeper@swfwmd.state.fl.us, Xinjian.Chen@swfwmd.state.fl.us, Yonas.Ghile@swfwmd.state.fl.us

Issue Information:

Internal Request: Off

Contact Information:

Last Name:	Wells Brennan	**First Name:**	Amy
Company:	Manson Bolves Donaldson Varn, PA	**Email Address:**	abrennan@mansonbolves.com
Phone:	813-514-4700	**Street Address:**	109 N. Brush Street, Suite 300
City:	Tampa	**State:**	Florida
Zip / Postal Code:	33602		

David M. Caldevilla
Edward P. de la Parte, Jr.
Richard A. Gilbert
Donald C. Greiwe

de la Parte & Gilbert, P.A.
ATTORNEYS AT LAW
40
1975 - 2015

Patrick J. McNamara
Kristin Y. Melton
Nicolas Q. Porter

Louis A. de la Parte, Jr.
Founder (1929-2008)

May 29, 2018

Via Email and U.S. Mail

Ms. Karen E. West, Esq.
General Counsel
Southwest Florida Water
Management District
7601 U.S. 30 North
Tampa, Florida 33637-6799
karen.west@watermatters.org

Re: **Public Record Request to Southwest Florida Water Management District**

Dear Ms. West,

Pursuant to Section 119.07, Florida Statutes, I request copies of the following documents which are Public Records (as that term is defined in Section 119.011(12), Florida Statutes), in the possession and control of the Southwest Florida Water Management District and its officials, employees, agents, attorneys and all other persons acting on its behalf (collectively the "District"):

1. An electronic copy of all hydrologic and system models, along with any maps in GIS format, prepared by, ran by or reviewed by the District in connection with the analysis described in the "Preliminary Impact Assessment for a Proposed WUP on the Peace River" Presentation dated May 4, 2018, a copy of which is attached as **Exhibit A**.
2. An electronic copy of all hydrologic and system models, along with any maps in GIS format, prepared by, ran by or reviewed by the District in connection with any updates, revisions or modifications to the analysis described in the "Preliminary Impact Assessment for a proposed WUP on the Peace River" Presentation dated May 4, 2018, a copy of which is attached as **Exhibit A**.
3. All QA/QC documents of the analysis described in the "Preliminary Impact Assessment for a Proposed WUP on the Peace River" Presentation dated May 4, 2018, a copy of which is attached as **Exhibit A**.
4. All documents describing what constitutes acceptable impacts on MFLs and withdrawals as stated in the "Limitations and Recommendations" Slide in the "Preliminary Impact Assessment for a proposed WUP on the Peace River" Presentation dated May 4, 2018, which is attached as **Exhibit A**.

5. All documents describing what constitutes tributary flows downstream of Zolfo Springs gage as stated in the "Limitations and Recommendations" Slide in the Preliminary Impact Assessment for a proposed WUP on the Peace River" Presentation dated May 4, 2018, which is attached as **Exhibit A**.

6. All documents describing the specifics of the proposed Peace River/Manasota Regional Water Supply Authority's ("Authority") proposed Water Use Permit No. 20010420.010 ("Proposed Permit") were not known to the District, as stated in the "Limitations and Recommendations" Slide in the "Preliminary Impact Assessment for a proposed WUP on the Peace River" Presentation dated May 4, 2018, which is attached as **Exhibit A**.

7. An electronic copy of all hydrologic and system models, along with any maps in GIS format, prepared by, ran by or reviewed by the District in analyzing the impact of the Polk Regional Water Cooperative's ("PRWC") Application for WUP No. 20020758.000 to withdraw water from the Peace River near Ft. Meade at an annual average daily rate of 18 MGD and a maximum daily rate of 50 MGD on existing and proposed minimum flows and reservations in the Peace River and the Authority's existing Water Use Permit (No. 20010420.009) and its Proposed Permit.

8. An electronic copy of all hydrologic and systems models, along with any maps in GIS format, prepared by, ran by or reviewed by the District in analyzing the impact of the three proposed flow-based blocks for the Lower Peace River described in the attached 2018 presentation, a copy of which is attached as **Exhibit B**, on the Authority's ability to withdraw water for consumptive use under its existing Water Use Permit (No. 20010420.009) and its Proposed Permit.

9. All documents describing how the three calendar-based block diversion limits contained in Special Condition 8 of the Authority's existing Water Use Permit (No. 20010420.009) would match up with the three proposed flow-based blocks for the Lower Peace River described in the attached 2018 presentation, a copy of which is attached as **Exhibit B** and how the District would ensure that the Authority's withdrawal of water would not violate the new proposed minimum flows for the Lower Peace River.

10. All documents describing how the three calendar-based block diversion limits contained in Special Condition 4 of the Authority's Proposed Permit would match up with the three proposed flow-based blocks for the Lower Peace River described in the attached 2018 presentation, a copy of which is attached as **Exhibit B** and how the District would ensure that the Authority's withdrawal of water would not violate the new proposed minimum flows for the Lower Peace River.

11. An electronic copy of all hydrologic and system models, along with any maps in GIS format, prepared by, ran by or reviewed by the District in analyzing the impact of the proposed new Lake Hancock Peace River Reservation described in the

attached "Lake Hancock – Peace River Reservation" Presentation dated March 20, 2018, a copy of which is attached as **Exhibit C,** on the Authority's ability to withdraw water for consumptive use under its existing Water Use Permit (No. 20010420.009) and its Proposed Permit.

Please note this public record request should be interpreted to include responsive public records contained in the private email accounts or in the text messages of any District official, employee, agent and attorney. The phrase "private email account" means any email account not maintained on mail server owned or controlled by the District. The term "text messages" means any text message sent or received by any District official, employee, agent and attorney from any computer, cellphone, or other type of mobile device with texting capabilities.

Pursuant to Section 119.07(1)(e) and 119.07(1)(f), Florida Statutes, we request you to "state in writing and with particularity" any conclusion that any requested Public Record herein or any portion thereof is exempt from the disclosure requirements of Chapter 119, Florida Statutes. The statement shall include the exemption, which you "contend is applicable to the record, including the statutory citation to an exemption created or afforded by statute." If portions of a document are exempt from disclosure, Section 119.07(1)(d) requires that you "shall redact that portion of the record with respect to which an exemption has been asserted and validly applies, and… shall produce the reminder of such record…."

Please provide my paralegal, Linda Foy, within an estimate of the cost of fulfilling, this request prior to copying any documents. Ms. Foy will contact your office within the next few days for the status of this request. In the meantime, however, if you have questions, please do not hesitate to contact Ms. Foy by email at lfoy@dgfirm.com or by telephone at 813-276-798.

Thank you for your prompt attention to this request.

Sincerely Yours;

de la Parte & Gilbert, P. A.

Edward de la Parte

Edward P. de la Parte, Jr.

EXHIBIT A

Preliminary Impact Assessment for a Proposed WUP on the Peace River

Yonas Ghile, Lei Yang and Doug Leeper
Resource Management Division
May 4, 2018

- Questions and constraints
- WUP impact assessment methods & metrics
- Impact assessment results
- Conclusions and Limitations

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Questions and Constraints

- Question 1: Can 5 mgd be withdrawn from the Peace River at the border of Polk and Hardee counties and on how many days?
- Question 2: Can an annual average of 5 mgd be withdrawn from the Peace River at the border of Polk and Hardee counties?
- Constraints
    - Upper Peace River minimum flows
    - Middle Peace River minimum flows
    - Lower Peace River minimum flows
    - Existing legal use (PRMWSA withdrawals)

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Selected Peace River Minimum Flows and WUPs

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WUP Impact Analysis Methods

- Spreadsheet model used to simulate Lake Hancock water levels and Peace River flows from 1975 through 2012 (38 years or 13,880 days).
- Reference condition scenario simulated with flow from Lake Hancock at a 100-ft control level, and releases from the lake when the lake level was between 97.5 and 100.0 ft to meet Upper Peace River minimum flow requirements and compensate for sink losses of 25 cfs in the upper river.
- Results from various WUP scenario simulations were compared to results from reference condition simulation to assess potential impacts.

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WUP Impact Analysis Metrics

Metrics			
Upper Peace River MFLs	Middle Peace River MFLs	Lower Peace River MFLs	PRMRWSA Withdrawals
Change in the number of days MFL flow target of 45 cfs met at Zolfo Springs gage	**Compliance** with MFLs at Arcadia gage	**Change in** seasonal average flows to Charlotte Harbor	**Change in:** 1. Annual average 2. Monthly average 3. Seasonal block-specific averages 4. Frequency of days of no (i.e., zero), average and maximum withdrawals

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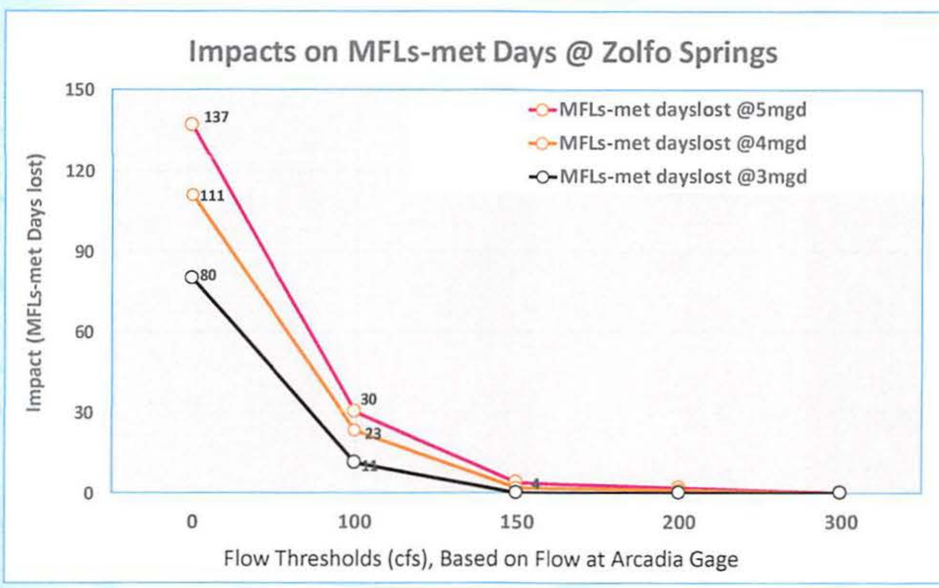
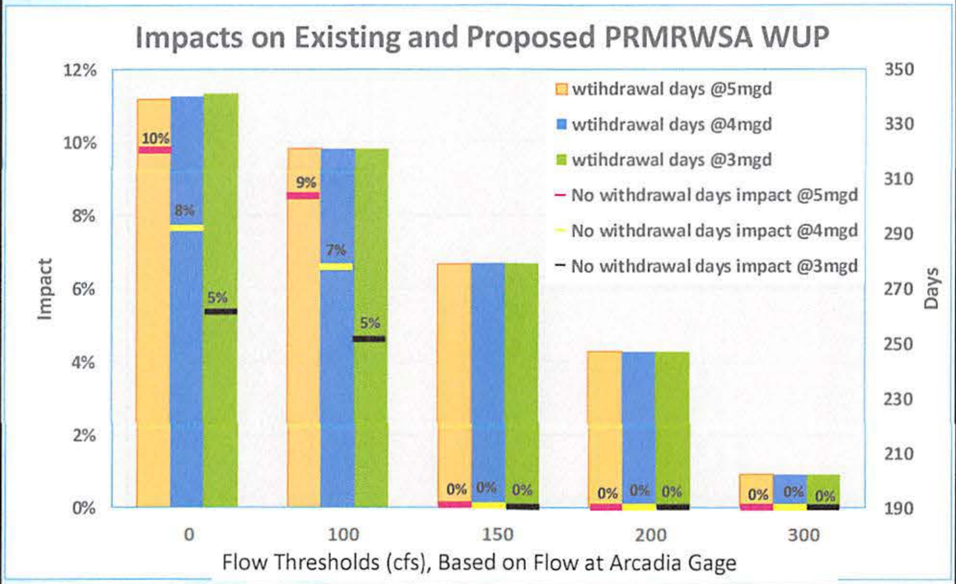
First Analyses Results : Fixed 5, 4 and 3 MGD Proposed Withdrawals



SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

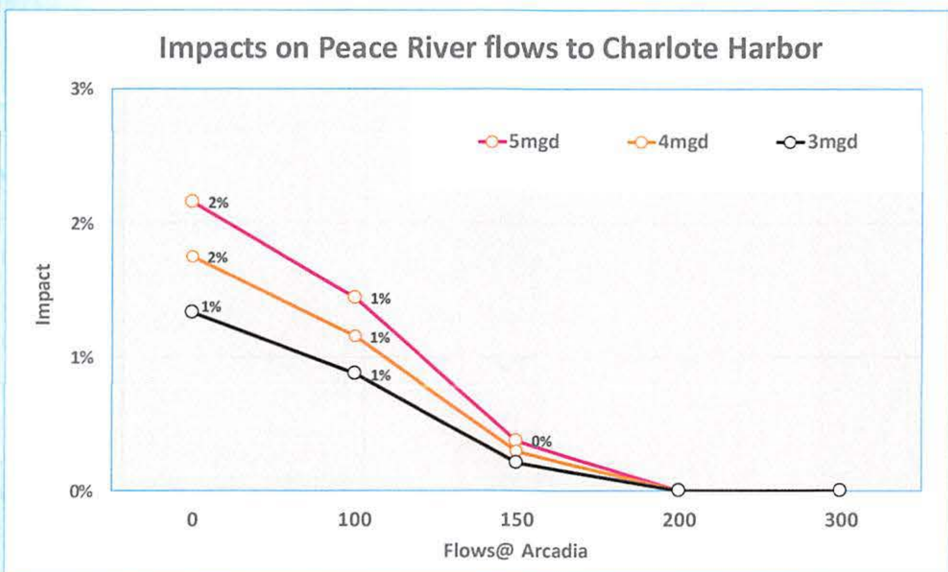
First Analyses: Fixed 5, 4 and 3 MGD Proposed Withdrawals



SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

First Analyses Results : Fixed 5, 4 and 3 MGD Proposed Withdrawals

(continued)



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First Analyses: Proposed WUP Impacts

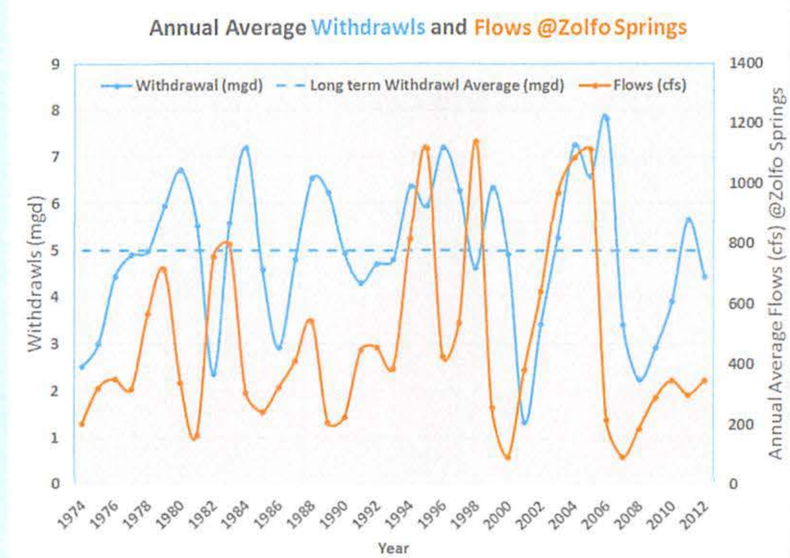
Metrics		
Upper Peace River MFLs	Change in the number of days MFL flow target (45 cfs) met at Zolfo Springs gage	Some change
Middle Peace River MFLs	Compliance with MFLs at Arcadia gage	Met
Lower Peace River MFLs	Change in seasonal average flows to Charlotte Harbor	Met; <1% change in block-specific flows
PRMRWSA Withdrawals	Change in: 1. Annual average 2. Monthly average 3. Seasonal block specific averages	 <2.4% <1.5% <1%
	4. Frequency of days of No (i.e., zero) Average Maximum withdrawals	 <1% <1% <1%

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Second Analyses Results: Variable Proposed Withdrawals with 5 MGD Annual Average*

Flow at Arcadia Gage (cfs)	Allowable Withdrawal (mgd)
<150	0
150 to 250	3
>250 to 500	6.5
> 500	8

* Assumes all withdrawn water can be stored



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Second Analyses: Proposed WUP Impacts

Metrics		
Upper Peace River MFLs	Change in the number of days MFL flow target (45 cfs) met at Zolfo Springs gage	Some change
Middle Peace River MFLs	Compliance with MFLs at Arcadia gage	Met
Lower Peace River MFLs	Change in seasonal average flows to Charlotte Harbor	Met; <1% change in block-specific flows
PRMRWSA Withdrawals	Change in: 1. Annual average 2. Monthly average 3. Seasonal block specific averages 4. Frequency of days of No (i.e., zero) Average Maximum withdrawals	 <2% <2% <2% No change 1% 1%

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Conclusions

- Proposed 5 mgd annual average withdrawals from the Peace River at the border of Polk and Hardee counties appear to have minimal impact on minimum flows established for the river when withdrawals are limited to days when flow at the Arcadia gage exceeds 150 cfs.
- Similar conclusion for impacts on existing, permitted withdrawals from the lower river at the PMRWSA intake, and on theoretical withdrawal limits associated with draft minimum flows in preparation for the lower river.
- Impact assessment results used for conclusions are subject to several limitations.

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Limitations and Recommendations

- QA/QC not fully completed, based on time constraints
  QA/QC will be completed.
- Acceptable impacts on MFLs and withdrawals not well defined.
  Acceptable impacts on MFLs and WUPs should be defined.
- Tributary flows downstream of Zolfo Springs gage confound use of Arcadia gage impacts for assessing upper river impacts.
  Metric based on flow threshold at Zolfo Springs gage could be developed and used for additional model simulations.
- Specifics of proposed PRMWSA WUP not known.
  Additional model simulations with known permit constraints could be completed.
- Effects of the scheduled 2022 reevaluation of minimum flows for three upper river segments not known.
  Additional model simulations should be completed once revised minimum flows are known.

PRMRWSA PERMIT & MFLs

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PRMRWSA

USGS Horse Creek, Joshua Creek and Peace River at Arcadia Gages

Period	Effective Dates	Where Flow on Previous Day Equals:	Allowed Withdrawals are:
Block 1	April 20 through June 25	<130 cfs ≥130 cfs	0 cfs 16% of the previous day's flow*
Block 2	October 28 through April 19	<130 cfs ≥130 cfs and <625 cfs ≥625 cfs	0 cfs 16% of the previous day's flow* 28% of the previous day's flow*
Block 3	June 26 through October 27	<130 cfs ≥130 cfs and <625 cfs ≥625 cfs	0 cfs 16% of the previous day's flow* 28% of the previous day's flow*

*Not to exceed the difference between the combined previous day's flows at the Horse Creek near Arcadia, Joshua Creek at Nocatee and Peace River at Arcadia and 130 cfs. Also, withdrawals are capped at 120 million gallons per day for any 24-hour period for frost/freeze crop protection.

Lake Hancock Minimum Levels

Minimum and Guidance Levels	Elevation (feet above NGVD29[a])	Elevation (feet above NAVD88[b])	Level Descriptions
High Minimum Lake Level	98.8	97.9	Elevation that a lake's water levels are required to equal or exceed ten percent of the time on a long-term basis
Minimum Lake Level	97.6	96.7	Elevation that the lake's water levels are required to equal or exceed fifty percent of the time on a long-term basis

[a] National Geodetic Vertical Datum of 1929.
[b] North American Vertical Datum of 1988.

Upper Peace River Minimum Flows

Location/Gage	Minimum Flow
Bartow / USGS Bartow River Gage No. 02294650	Annual 95% exceedance flow of 17 cfs
Ft. Meade / USGS Ft. Meade River Gage No. 02294898	Annual 95% exceedance flow of 27 cfs
Zolfo Springs / USGS Zolfo Springs River Gage No. 02295637	Annual 95% exceedance flow of 45 cfs

Middle Peace River Minimum Flows

USGS Peace River at Arcadia Gage

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is:
Annually	January 1 through December 31	≤67 ≤67 cfs and <1,362 >1,362	67 cfs Seasonally dependent – see Blocks below Previous day flow minus 8%
Block 1	April 20 through June 25	≤67 >67 cfs and <75 cfs >75 cfs and <1,362 >1,362	67 cfs 67 cfs Previous day flow minus 10% Previous day flow minus 8%
Block 2	October 27 through April 19	≤67 >67 cfs and <82 cfs >82 cfs and <1,362 >1,362	67 cfs 67 cfs previous day flow minus 18% previous day flow minus 8%
Block 3	June 26 through October 26	≤67 cfs >67 cfs and <73 cfs >73 cfs and <1,362 cfs >1,362	67 cfs 67 cfs previous day flow minus 13% previous day flow minus 8%

Lower Peace River Minimum Flows

USGS Horse Creek, Joshua Creek and Peace River at Arcadia Gages

Period	Effective Dates	Where Flow on Previous Day Equals:	Minimum Flow Is:
Annually	January 1 through December 31	≤130 cfs >130 cfs	Actual flow (no surface water withdrawals permitted) Seasonally dependent – see Blocks below
Block 1	April 20 through June 25	≤130 cfs >130 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs*
Block 2	October 28 through April 19	≤130 cfs >130 cfs and <625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs* Previous day's flow minus 29%
Block 3	June 26 through October 27	≤130 cfs >130 cfs and <625 cfs ≥625 cfs	Actual flow (no surface water withdrawals permitted) Previous day's flow minus 16% but not less than 130 cfs* Previous day's flow minus 38%*

* The total permitted maximum withdrawals on any day shall not exceed 400 cfs.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Contact Information

Name: Doug Leeper

Title: MFLs Program Lead

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2379 Broad St.
Brooksville, FL 34604-6899

Phone: 1-800-423-1476 or 352-796-7211, Extension 4272

E-Mail: doug.leeper@watermatters.org

Web Site: watermatters.org

EXHIBIT B

Southwest Florida Water Management District

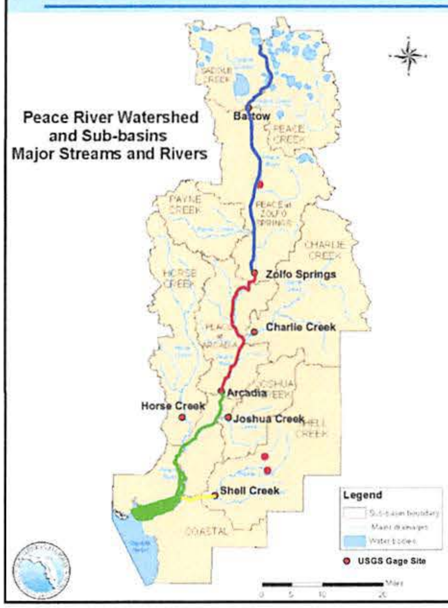
Presentation Outline

1) Background
2) Current MFLs/Permit for Lower Peace River
3) MFL Reevaluation methodology
   - LPR MFL Boundary
   - Modeling Approach
   - Seasonal Blocks
4) Proposed MFLs
5) Impact Assessment
   - Water Supply (PRMRWSA and City of PG)
   - Floodplain inundation, and
   - Fish habitat (underway)

1

Southwest Florida Water Management District

Background



- Peace River Basin: 2,350 square miles
- 75 miles long
- Peace River MFLs
  1) Upper Peace River (@Bartow, @Forte Meade, and @ Z springs) – low flows
     - Reevaluation scheduled in 2022
  2) Middle Peace River (@ Z springs and @Arcadia)
  3) Lower Peace River (combined flows from Peace river @Arcadia, Horse Creek and Joshua Creek)
     - Reevaluation scheduled in 2018

2

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Current MFLs/Permit Rules

Flows (cfs)	LPR Existing MFL/Permit Rules		
	Block 1 (Apr 20-Jun 25)	Block2 (Oct 27-Apr 19)	Block 3 (Jun 26-Oct 26)
<130	0% (0%)		
130 -625	16% (16%)		
≥ 625	16% (16%)	29% (28%)	38% (28%)
Actual Withdrawals	10%	13%	6%

- PRMRWSA WUP in bracket
- 130 cfs- to maintain freshwater at PRMRWSA plant
- 625 cfs- a threshold to avoid more than 15% habitat loss when flows are low in B2 and B3 periods
- Maximum daily withdrawal shall not exceed 400 cfs (258mgd)
- The MFL was established based on <2ppt salinity habitat
- No existing MFL for Shell Creek

3

MFL Reevaluation

1) Improved data and hydrodynamic model outputs
   - Improved baseline flows
   - Extended boundary conditions
   - New LiDAR and bathymetry data
   - Longer calibration period
2) Simplified Seasonal blocks introduced
3) Environmental changes associated with withdrawals were evaluated using HBMP data
4) Ecological modeling to assess MFLs
   - Fish Habitat Suitability
   - Floodplain inundation

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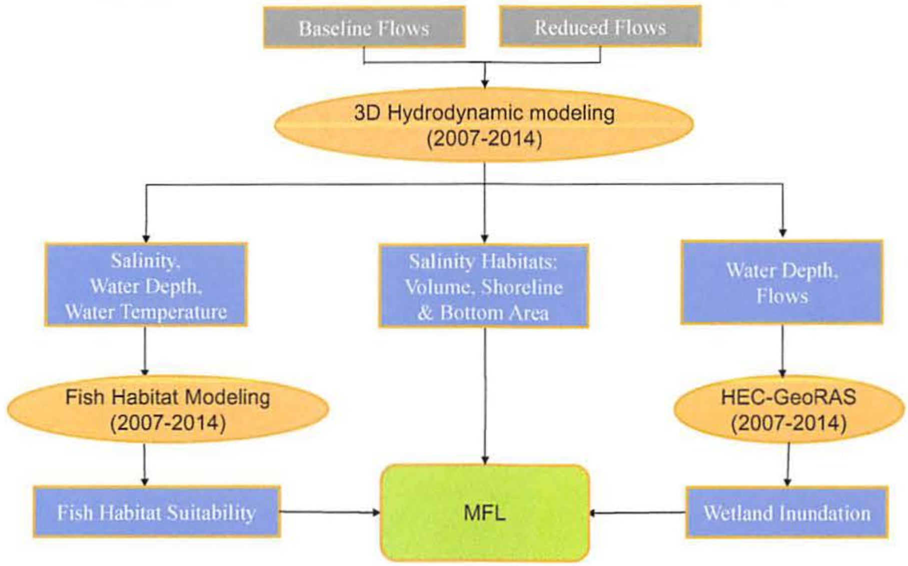
Modeling Approach



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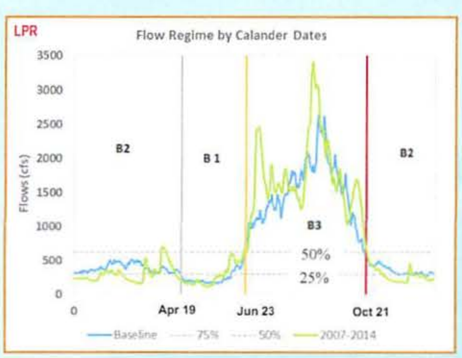
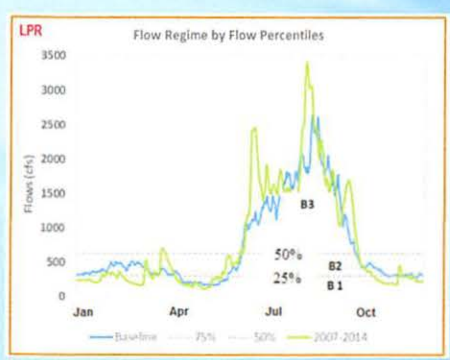
Why change in Seasonal Blocks?

1. To have a better representation of flow regimes that correspond to periods of low, medium and high flows.
2. To avoid a **trigger threshold** that is required to avoid significant harm in B2 and B3 when flows are low (e.g. 625cfs for LPR)





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Water Management District

LPR MFL

	Flows (cfs)	B1 (Apr 19- Jun 23)	B2 (Oct 22-Apr 18)	B3 (Jun 24-Oct 21)
Existing MFL using Calender Dates	<130		0%	
	130-625		16%	
	>625	16%	29%	38%

	B0 <130 cfs	B1 (130-297 cfs)	B2 (297-622 cfs)	B3 (>622 cfs)
New MFL using Flow Percentiles	0%	13%	23%	40%

- Like the existing MFL, the new MFL is established based on maintaining 85% of **<2ppt** salinity habitat
- Withdrawals based on the preceding combined flows measured from Peace River at Arcadia, Horse Creek and Joshua Creek
- Maximum daily withdrawal shall not exceed **400 cfs (258.4 mg)**

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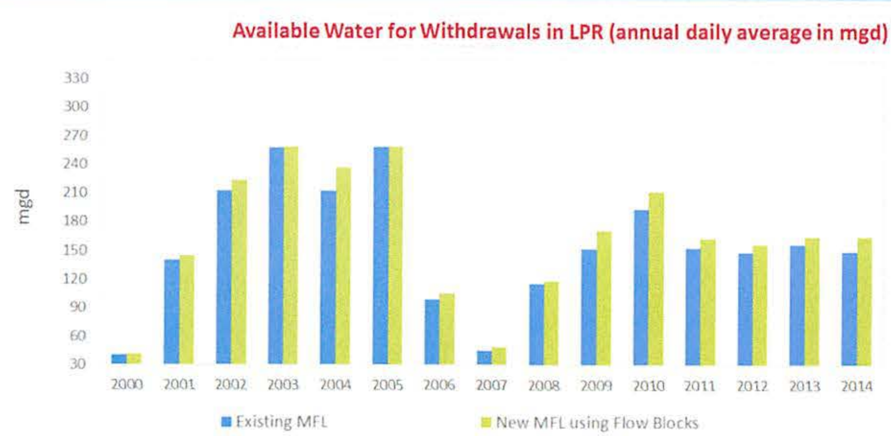
LPR MFLs Assessment



MFL	Daily Avg. Withdrawals (mgd)	% of Days with zero Withdrawals	% of Days with Above Avg. Withdrawals	% of Days with Maximum Withdrawals
Existing MFL	118	10.7%	45.3%	38.0%
New MFL	127	10.7%	48.6%	44.1%

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Lower Shell Creek MFL

	B1	B2	B3
New MFL using	(0-56 cfs)	(56-137 cfs)	(>137 cfs)
Flow Percentiles	13%	23%	40%

- The proposed MFL is established based on maintaining 85% of **<2ppt** salinity habitat
- Withdrawals based on previous daily flows measured at USGS Gage 02298202 located on the crest of the dam

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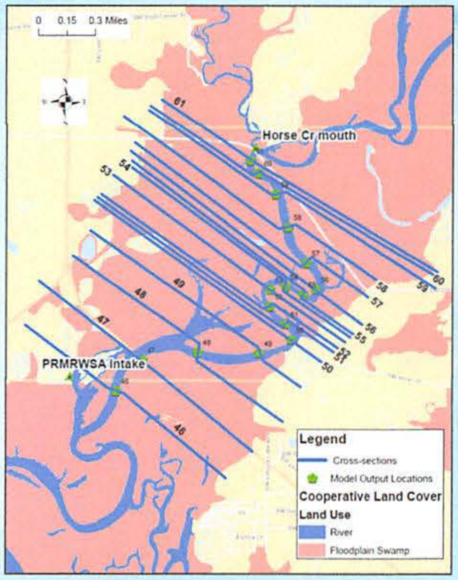
MFL Impact on Floodplain wetlands



- A 40% flow reduction corresponds to 7% decrease in inundated wetland habitat.

10

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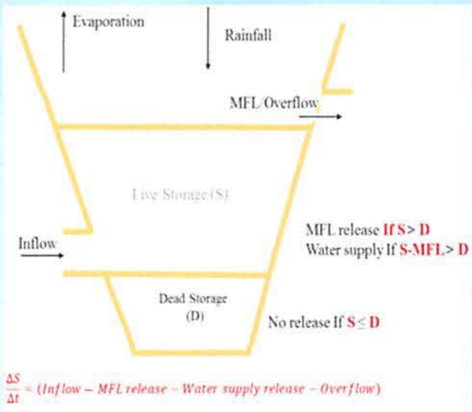
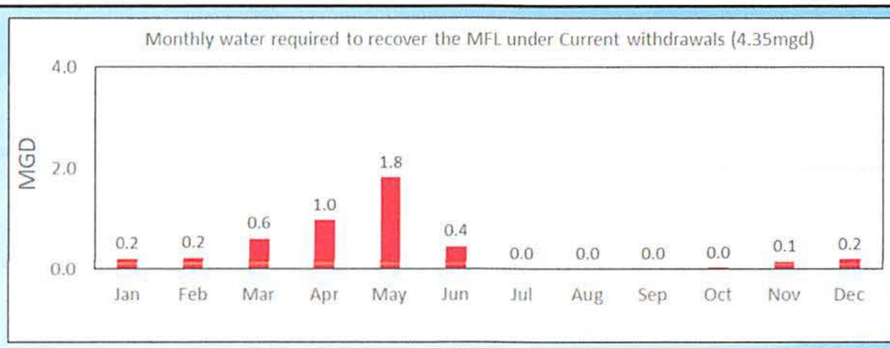
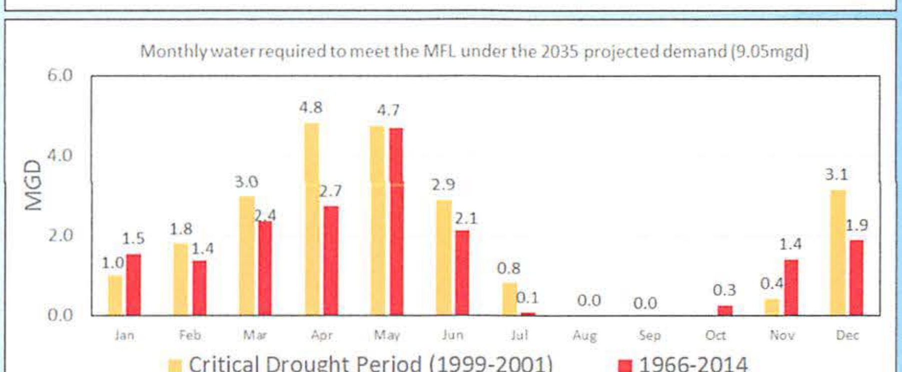
City of Punta Gorda Water Supply



- Current actual demand= 4.45 mgd
- Current WUP = 8.088 mgd
- 2035 projected WUP = 9.05 mgd
- Active capacity ~ 320 mg

11





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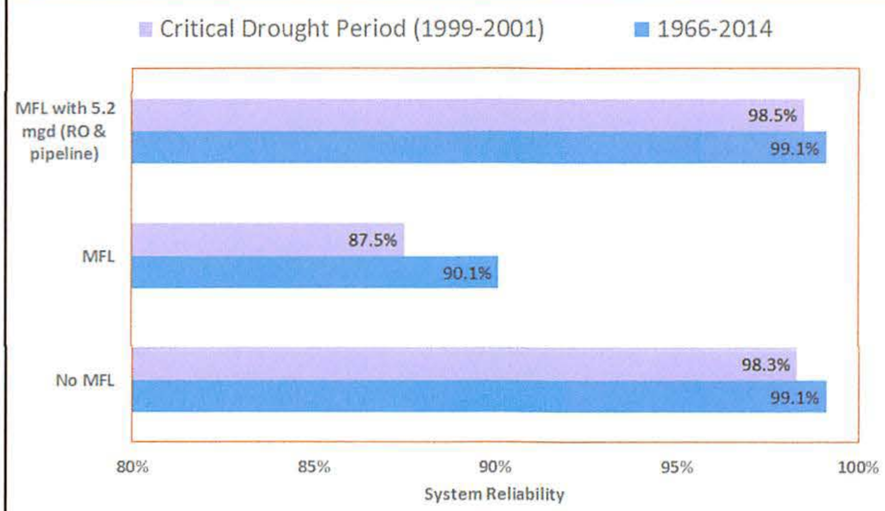
Reliability in Meeting 2035 Demand



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Summary

New MFL for LPR	B0 <130 cfs	B1 (130-297 cfs)	B2 (297-622 cfs)	B3 (>622 cfs)
	0%	13%	23%	40%

* Maximum daily withdrawal shall not exceed 400 cfs (258.4 mg)

New MFL for Shell Creek	B1 (0-56 cfs)	B2 (56-137 cfs)	B3 (>137 cfs)
	13%	23%	40%

- No recovery/prevention strategy is required for LPR; the PRMRWSA is not expected to be negatively impacted.
- Recovery/prevention strategy is required for Lower Shell Creek.
- The RO & Peace River pipeline facilities are capable of providing he City's needs about 5.2 mg per day to recover MFLs and meet the projected 2035 water demand (9.05mgd).

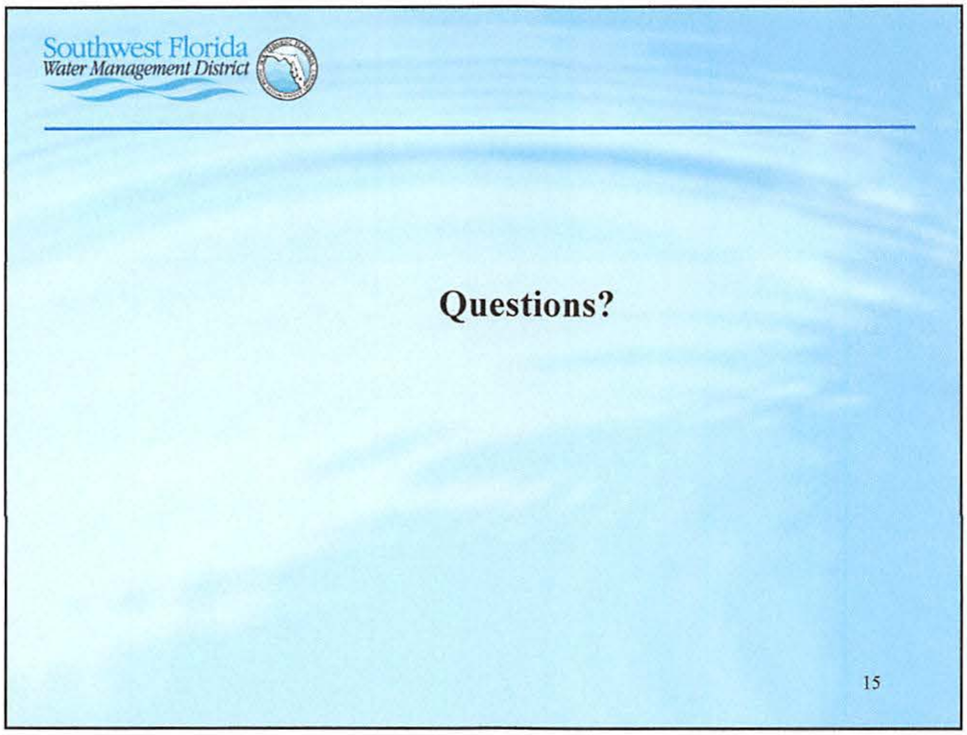
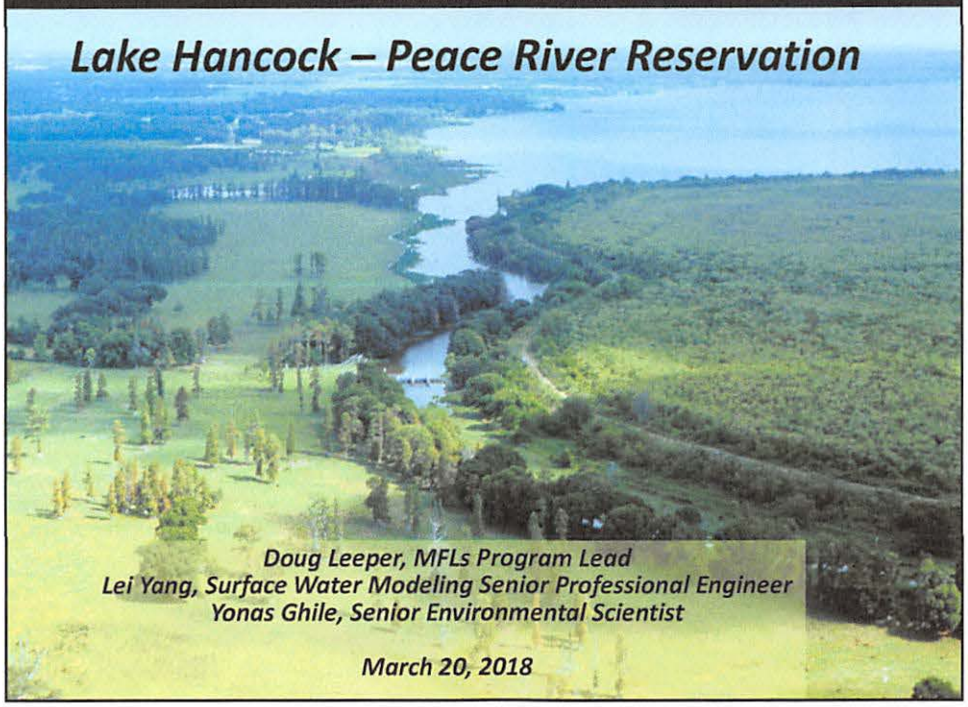

Southwest Florida
Water Management District
Questions?
15

EXHIBIT C

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT



SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Agenda

- Reservations overview
- Need for reservation – Lake Hancock/Upper Peace River
- History/plans for MFLs and reservations associated with Lake Hancock/Peace River
- Proposed schedule
- Next steps/action items

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Reservations – Florida Water Resources Act of 1972

"The governing board or the department, by regulation, may **reserve from use by permit applicants**, water in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety. Such reservations shall be subject to periodic review and revision in the light of changed conditions. However, all presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest."

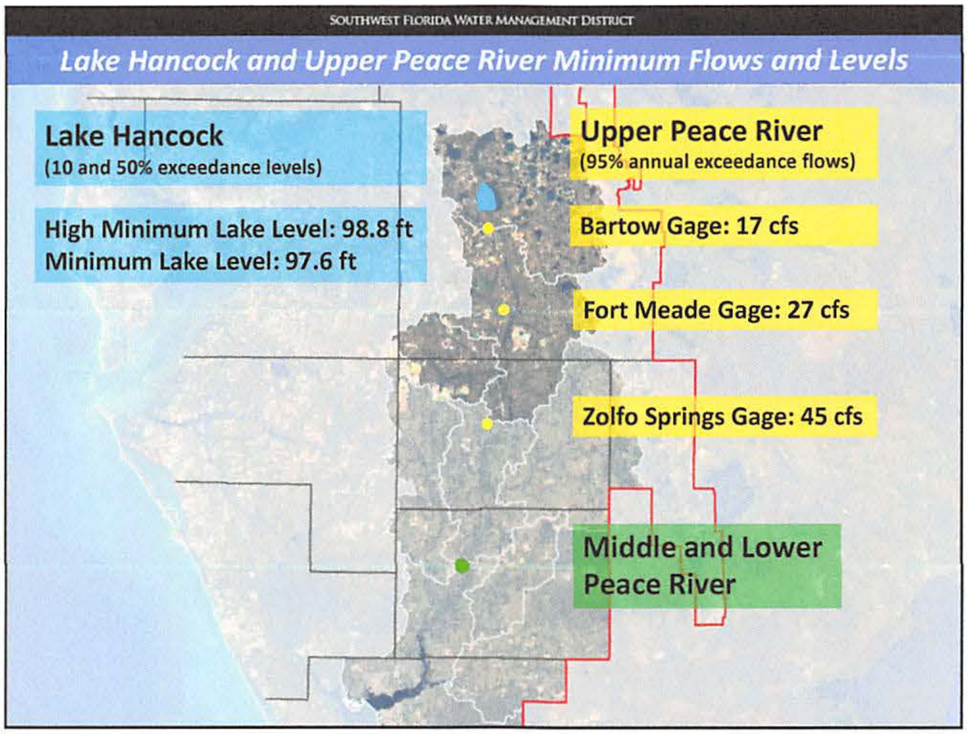
Section 373.223(4), F.S. -- Conditions for a permit

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Reservations – Water Resource Implementation Rule

- May be used for protection of fish and wildlife to **aid in a recovery or prevention strategy for a water resource with an established minimum flow or level**
- May be used for protection of public health/safety
- Existing legal uses of water protected, if not contrary to the public interest
- Location, quantity, timing and distribution of reserved water should be described
- Peer-reviewed, as needed
- Subject to periodic review, at least every 5 years

Summarized from Rule 62-40.474, F.A.C.



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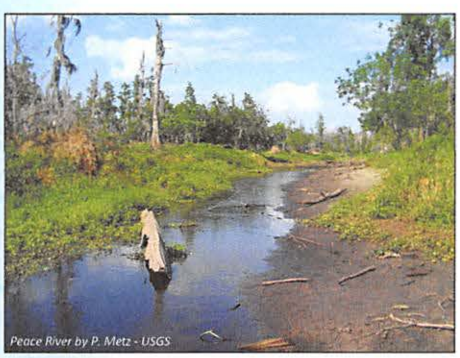
Status Assessments



Peace River by P. Metz - USGS

- Upper Peace River minimum flows **are not being met**

Lake Hancock

- Lake Hancock minimum levels **are being met**

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Status Assessment for the Upper Peace River Minimum Flows

40D-8.041 (F.A.C.)

(7) Minimum Flows for upper Peace River.

(d) Compliance – **The Minimum Low Flow is achieved when the measured flow rate is at or above the Minimum Low Flow for three consecutive years**. Once the Minimum Low Flow has been achieved for three consecutive years, the Minimum Low Flow is not met when the measured flow rate is below the Minimum Low Flow for two out of ten years commencing the year after achievement. If the two years below the minimum flow occur anytime before the ten year period is complete, the upper Peace River is deemed below its Minimum Low Flow and the three consecutive years above the Minimum Low Flow is again required for compliance. Once the ten-year period is complete, the period will roll forward one year each year.

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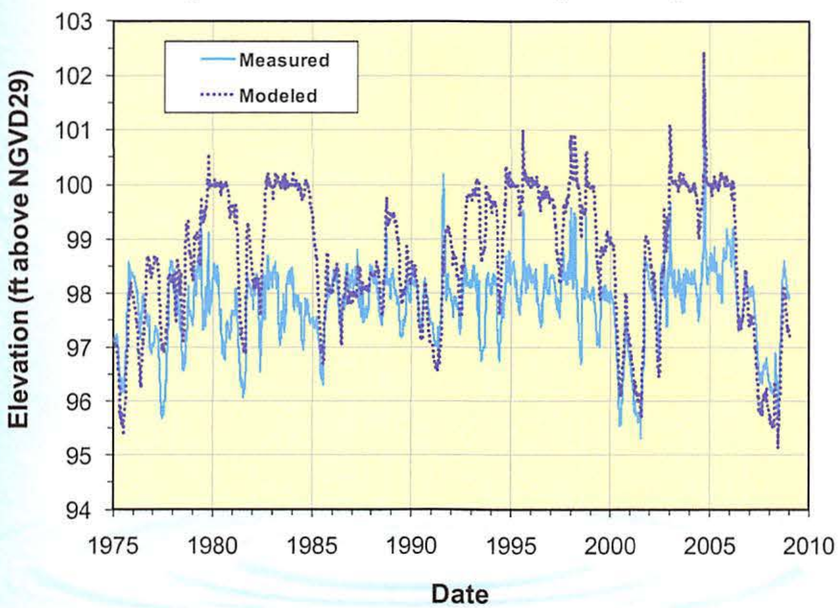
Measured Levels and Modeled (Based on New Structure Operation) Levels



Peace River and Lake Hancock Minimum Flows and Levels and Reservation History/Plans

Action	When Occurred or Scheduled
Middle Peace River minimum flows adopted	Jan. or Mar. 2006
Upper Peace River minimum flows adopted (low flow thresholds only)	Dec. 2006
Initiation of rulemaking to reserve flows in Upper Peace watershed	May 2009
Rulemaking updates	2009 - 2015
Lower Peace River minimum flows adopted	Jul. 2010
Reauthorization of the initiation of rulemaking to reserve flows	Jul. 2015
Lower Peace River minimum flows reevaluated (no change)	Sep. 2015
Lake Hancock minimum levels adopted	Nov. 2016
Lower Peace River minimum flows reevaluation	2018 (scheduled)
Lake Hancock reservation adoption	2018 (scheduled)
Upper Peace River minimum flows reevaluation	2022 (scheduled)
Horse Creek minimum flows adoption	2023 (scheduled)

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Old Draft Reservation Language

Reservation For Upper Peace River MFL
DRAFT 6-9-11
40D-2.302 Reservations of Water From Use

(1) No change.

(2) The District is implementing minimum flow recovery projects for the upper Peace River as described in the Southern Water Use Caution Area (SWUCA) Recovery Strategy dated March 2006, available upon request to the District and on the District's website at http://www.swfwmd.state.fl.us/documents/plans/swuca_recovery_strategy.pdf ("Recovery Strategy"). Certain of the projects will capture and store water during high flow periods and then release water during low flow periods or otherwise make water available to the natural systems that is necessary for the recovery of the upper Peace River minimum flows set forth in 40D-8.041. Therefore, the Governing Board finds it necessary to reserve from allocation and use by permit applicants the following water described in (b), below, for use in achieving and maintaining minimum flows established for the upper Peace River.

(a) For purposes of this subsection (2) the following definitions shall apply:

1. "Ft. Meade Gauge" shall mean USGS Gauge No. 02294898 at Ft. Meade, Florida.
2. "Arcadia Gauge" shall mean USGS Peace River near Arcadia Gauge No. 02296750.
3. "Horse Creek Gauge" shall mean USGS Horse Creek near Arcadia Gauge No. 02207310.
4. "Joshua Creek Gauge" shall mean USGS Joshua Creek at Nocatee Gauge No. 02297100.

(b) Each day, the lesser of 1. or 2., below, but not to exceed 100 cubic feet per second ("cfs"). For purposes of this paragraph (b), unaffected flow means flow that would occur in the absence of permitted withdrawals from the Peace River and the reservation set forth in this subsection (2).

1. Up to 10% of the daily flow that is above 27 cfs as measured at the Ft. Meade Gauge.
2. A daily flow based on the day of the year as follows:
   a. April 20 through and including June 25, up to 16% of the daily flow that is above 1160 cfs based on the sum of the unaffected daily flow at the Arcadia Gauge, Horse Creek Gauge and Joshua Creek Gauge but only such flow that when captured does not cause the daily flow to fall below 1160 cfs.
   b. October 28 through and including April 19, up to 29% of the daily flow that is above 663 cfs based on the sum of the unaffected daily flow at the Arcadia Gauge, Horse Creek Gauge and Joshua Creek Gauge but only such flow that when captured does not cause the daily flow to fall below 663 cfs.
   c. June 26 through and including October 27, up to 38% of the daily flow that is above 663 cfs based on the sum of the unaffected daily flow at the Arcadia Gauge, Horse Creek Gauge and Joshua Creek Gauge but only such flow that when captured does not cause the daily flow to fall below 663 cfs.

(b) The Board also reserves from use by permit applicants the water stored in Lake Hancock at and below elevation 100.0 feet NGVD (1929) and 99.12 feet NAVD (1988) and water released from Lake Hancock to the Peace River when flow at the Ft. Meade Gauge is below 27 cfs that is needed to achieve the upper Peace River minimum flows set forth in 40D-8.041, F.A.C.

(2) is renumbered as (3)

Rulemaking Authority 373.044, 373.113, 373.171, FS. Law Implemented 373.223, FS. History-New 1-1-07, Amended 11-25-07,________.

Proposed Schedule

Action	Scheduled
Lower Peace River minimum flows reevaluation	2018
Lake Hancock reservation adoption	2018
-- Reservations report/rule preparation and internal review	May 2018
-- Peer review (as necessary)	July – August 2018
-- Stakeholder outreach (e.g., Polk Regional Water Cooperative, PRMWSA, CFWI: MFLRT/WRAT/MOC/SC)	May – August 2018
-- Rule development public workshop	September 2018
-- Governing Board presentation(s) and rulemaking -- **OPTION A**	
a. Draft reservation report/rule prior to peer review	June 2018
b. Peer review findings and staff response	October 2018
c. Final report and request to initiate rulemaking	November 2018
d. Rulemaking	Dec. 2018 – Feb. 2019
-- Governing Board presentation(s) and rulemaking -- **OPTION B**	
a. Draft reservation report/rule prior to peer review	June 2018
b. Peer review findings, staff response, final reservation/rule and request to initiate rulemaking	October 2018
d. Rulemaking	Nov. 2018 – Jan. 2019
Upper Peace River minimum flows reevaluation	2022 (scheduled)

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Next Steps / Action Items

- ❑ Continue review and revision of modeling scenario/reservation report
- ❑ Continue development of proposed rule language
- ❑ Develop/firm-up schedule for:
  - ❑ Staff presentations
  - ❑ SME review
  - ❑ Executive presentation
  - ❑ When to engage stakeholders

Contact Information

Name:	Doug Leeper
Title:	MFLs Program Lead
Mail:	Southwest Florida Water Mgmt. District 2379 Broad St. Brooksville, FL 34604-6899
Phone:	1-800-423-1476 or 352-796-7211, Extension 4272
E-Mail:	doug.leeper@watermatters.org
Web Site:	watermatters.org

EXTRA SLIDES

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

ADD SLIDES SHOWING MODELED EFFECTS OF RESERVATION ON FLOWS AND PRMWSA WITHDRAWALS

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

New Tool: Upper Peace River Status Report

Upper Peace River Status Report - 03/19/2018

Status

All gage stations are above MFLs. Discharge from P-11 continues to supplement flows in the river. Lake levels are around 99.80 NGVD29 ft. High rainfall chance for this Tuesday, 3/20/2018. Pumping to the WTS will be evaluated after the expected rainfall on Tuesday. Staff will continue to monitor flow rates, lake levels, and MFL operations.

Actions since last report:
Adjustment of P-11 Weir Gate 1

Scheduled Action:
Continued adjustment of P-11 weir gates, possible pumping to continue at WTS

MFL Operation Days

FY17	117
FY18	22

Bartow, cfs Above MFL
20.1

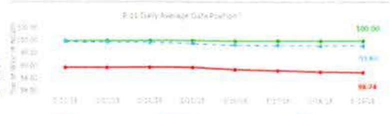
Fort Meade, cfs Above MFL
2.2

Flow Data (cfs) - 03/19/2018

Lake Tributary Inflow [1]	8
WTS Outfall [2]	0.0
P-11 Discharge [3]	28.6
Peace Creek near Bartow [4]	14
Peace River @ Bartow [4]	37
Peace River @ Fort Meade [4]	29
Peace River @ Zolfo Springs [4]	71

Stage Data (ft NGVD29) [5]

Lake Hancock	99.80		
WTS Cell 1	117.91	Depth	15.72 "
WTS Cell 2	116.50	Depth	16.74 "
WTS Cell 3	113.95	Depth	16.14 "



Infrastructure Check

P-11: Both weir gates at P-11 are now operational.
WTS: Pump removal and cable replacement began as scheduled on 3/5/2018 by Hydra Services; expected completion - 4/9/2018.

Upper Peace River MFLs: 17 cfs @Bartow; 27 cfs@Fort Meade; 45 cfs@Zolfo Springs

[1] Sum of tributary flows reported for the USGS gauges: Banana-Hancock Canal nr Highland City, Saddle Creek at SR 542 nr Lakeland, and Lake Lena Run nr Auburndale.
[2] Wetland Treatment System outfall flow from SCADA.
[3] Estimated using weir formula given gate elevations settings. A 0.15-ft tolerance was considered in weir flow estimate.
[4] The last reported USGS 15-minute data at the release of the status report was used.
[5] Cell stages/depths are average of inflow and outflow stages and depths if both are available.
[6] Rainfall read from SCADA from the site near P-11. Daily total were used for the chart.
[7] Full open position for weir gates 1 and 2 = 96 ft; close-up position for weir gates 1 and 2 = 100 ft.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Reservations
Rule 62-40.474, Florida Administrative Code

62-40.474 Reservations.

(1) The governing board or the department, by rule, may reserve water from use by permit applicants, pursuant to Section 373.223(4), F.S., in such locations and quantities, and for such seasons of the year, as in its judgment may be required for the protection of fish and wildlife or the public health and safety. Such reservations shall be subject to periodic review at least every five years, and revised if necessary in light of changed conditions. However, all presently existing legal uses of water shall be protected so long as such use is not contrary to the public interest.

(a) Reservations may be used for the protection of fish and wildlife to:

1. Aid in a recovery or prevention strategy for a water resource with an established minimum flow or level;
2. Aid in the restoration of natural systems which provide fish and wildlife habitat;
3. Protect flows or levels that support fish and wildlife before harm occurs;
4. Protect fish and wildlife within an Outstanding Florida Water, an Aquatic Preserve, a state park, or other publicly owned conservation land with significant ecological value; or
5. Prevent withdrawals in any other circumstance required to protect fish and wildlife.

(b) Reservations may be used for the protection of public health and safety to:

1. Prevent sinkhole formation;
2. Prevent or decrease saltwater intrusion;
3. Prevent the movement or withdrawal of groundwater pollutants; or
4. Prevent withdrawals in any other circumstance required to protect public health and safety.

(2) Reservations shall, to the extent practical, clearly describe the location, quantity, timing, and distribution of the water reserved.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Reservations
Rule 62-40.474, Florida Administrative Code (continued)

(3) Reservations can be adopted prospectively for water quantities anticipated to be made available. When water is reserved prospectively, the reservation rule shall state when the quantities are anticipated to become available and how the reserved quantities will be adjusted if the actual water made available is different than the quantity anticipated.

(4) The District shall conduct an independent scientific peer review of all scientific or technical data, methodologies, and models, including all scientific and technical assumptions employed in each model, used to establish a reservation if the District determines such a review is needed. In determining whether to conduct an independent scientific peer review the District should include consideration of:

(a) Whether or not the reservation is based on a previously peer-reviewed methodology;

(b) The level of complexity of the reservation;

(c) Whether or not the water body for which the reservation is being developed includes water resource characteristics that are substantially different than previously peer reviewed reservations; and

(d) The degree of public concern regarding the reservation.

(5) During the annual development and submittal of the minimum flow and level priority list, required by Section 373.042, F.S., the District shall identify any water bodies for which a reservation of water is proposed under Section 373.223(4), F.S., and whether the reservation is proposed for the protection of fish and wildlife or the public health and safety.

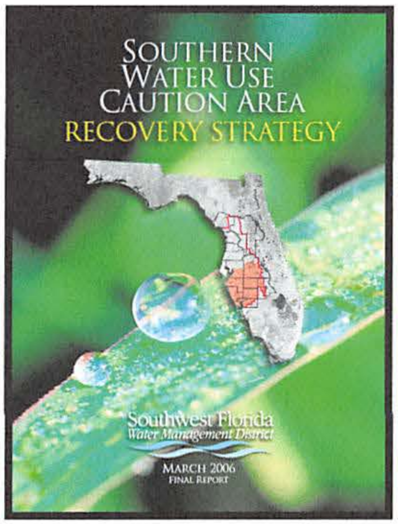
Rulemaking Authority 373.026(7), 373.036, 373.043, 373.171 FS. Law Implemented 373.023, 373.026, 373.036, 373.042, 373.046, 373.103, 373.106, 373.171, 373.175, 373.223, 373.246, 373.418, 373.451, 373.453, 373.703, 403.0891 FS. History–New 5-7-06, Amended 5-6-13.

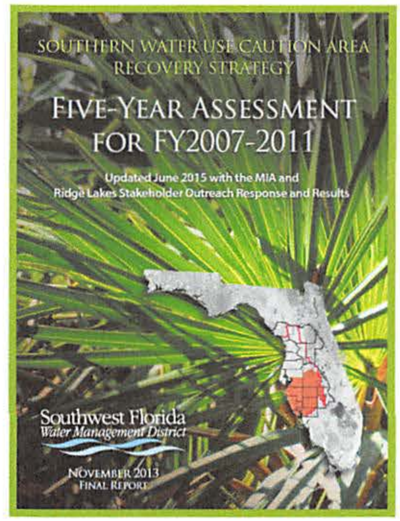

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
Lake Hancock Outfall Treatment Project
January 2014
Discharge and Aeration Structures
Pump Station
Location Map
Concept Plan
Southwest Florida Water Management District


SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
Lake Hancock Lake Level Modification
P-11 Structure Replacement Project
Old P-11 Structure Built in 1962
New P-11 Conceptual Design in 2008
Construction Began November 2011
New Structure in Operation September 2013
Location Map
Project Timeline
June 2007 Conceptual ERP Issued
March 2008 P-11 Structure Design Began
March 2010 P-11 Structure ERP Issued
November 2011 Construction Began
April 2013 New P-11 Structure Completed
May 2013 Old P-11 Structure Demolished
September 2013 Construction Completed
January 2014 P-11 Structure Remotely Operable via SCADA
Southwest Florida Water Management District
DMK
Stanley Consultants

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

SWUCA Recovery Strategy





SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Peace/Hancock – Reservation Issues

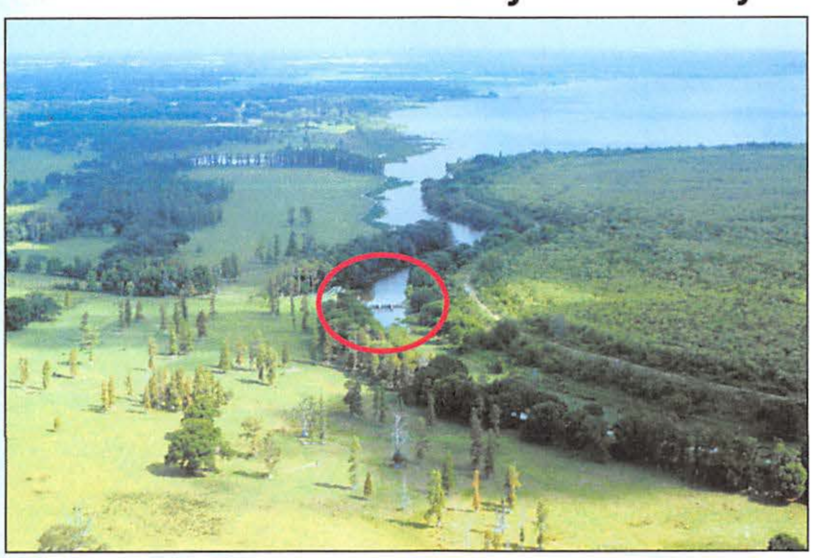
1. Upper Peace MFLs not met.
2. "Intermediate" and "high" MFLs scheduled for evaluation in FY2016 (will reevaluate all). Lower Peace supposed to be reevaluated in FY2015 (may be delayed).
3. Question: reservation for water in Hancock, Peace or both?
4. Draft reservation language prepared in 2010/2011 (see next slide).
5. Draft SERC for the reservation prepared in 2009

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

P-11 Structure

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Lake Hancock Level Modification Project



- Raise structure operating level 1.3 feet
- Store water for release to Peace River

From:	Edward Mc Donald
To:	Doug Leeper
Subject:	Minimum Flows and Levels
Date:	Sunday, July 29, 2018 1:00:47 PM

Mr. Leeper,

I am asking you these questions because you are listed as the lead for the SWFWMD minimum flows and levels effort. The Florida laws in this area are very vague as they depend on some understanding as to what is meant by significant harm. The Florida Statutes don't make any attempt to define what this term means. Basically everyone is left on their own to define what this means.

I am reading the 2010 version of the MFL discussion for the Lower Peace River and I see under section 8.1 a sentence that states: ""Significant" harm has been operationally defined as a 15% loss of available habitat." I applaud the efforts of the SWFWMD to take on trying to define such a nebulous concept, but the reality is that this "limit" is not supported by any of the other water management districts in Florida. The idea that this definition somehow lends creditability to a minimum flow determination defies logic.

The ability to define a minimum flow for a river is very difficult. There will never be a method that you can employ that will satisfy all stakeholders. A Florida river, by its very nature, can be viewed in many ways. To some, it's just a conveyance of rainwater to the ocean or some other large surface body to alleviate upstream flooding. In other words, it's not much more than a drainage ditch. To others, its a marvelous giver of life where every change in level is precious to the maintenance of a diverse, riverine ecology. In other words, high flows are just as important as low flows.

How does a water management district balance the utilitarian view of a river versus the environmentalist's view? Is it all about litigation and who has the deeper pockets? Are high flow rates just a nuisance that can be used without consequence? Will the exploitation of rivers result in "water wars".

I am not totally against using Florida's rivers for withdrawals by man, but we need to be very careful about so called unintended consequences and we should replace water withdrawn with appropriately treated wastewater.

Edward McDonald
Auburndale, FL

From:	Doug Leeper
To:	"Edward Mc Donald"
Bcc:	Chris A. Tumminia
Subject:	RE: Minimum Flows and Levels
Date:	Wednesday, August 01, 2018 2:01:00 PM

Mr. MacDonald:

Thanks for your interest in development of minimum flows for the lower Peace River and the minimum flows and levels development process.

The Southwest Florida Water Management District balances environmental protection and meeting water supply needs, in part through the establishment and implementation of minimum flows and levels. When developing minimum flows and levels, environmental values, including human-use and ecological factors are considered. Also, consideration is given to natural seasonal fluctuations in water levels and flow with the understanding that various ranges of flows or levels can be associated with differing environmental values. This means that high flow rates or water levels are not necessarily considered a nuisance, although they may, in some instances be associated with negative impacts, including flooding.

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doug.leeper@watermatters.org

From: Edward Mc Donald <emcdotomb@yahoo.com>
Sent: Sunday, July 29, 2018 12:58 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Minimum Flows and Levels

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Auburndale, FL

From:	Doug Leeper
To:	"emcdotomb@yahoo.com"
Bcc:	Chris A. Tumminia
Subject:	FW: Minimum Flows and Levels
Date:	Wednesday, August 01, 2018 2:46:00 PM

Mr. MacDonald:

I just looked at the email I sent to you this afternoon and noticed that I inadvertently left of a portion of my intended response. Here is my full response:

Thanks for your interest in development of minimum flows for the lower Peace River and the minimum flows and levels development process.

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Based on consideration of all relevant environmental values, and the acquisition and use of the best available information, District staff develop minimum flow and level recommendations for prioritized water bodies that are subject to independent, scientific peer review and review by all interested stakeholders. Staff recommendations, peer-review findings and input for all stakeholders is made available to the District Governing Board when they consider the establishment of a minimum flow or level into District rules.

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doug.leeper@watermatters.org

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Edward McDonald
Auburndale, FL

From:	Edward Mc Donald
To:	Doug Leeper
Subject:	Re: FW: Minimum Flows and Levels
Date:	Wednesday, August 01, 2018 9:27:52 PM

Mr. Leeper,

Thank you for the reply. You didn't specifically address my main point and that is the definition of significant harm. The understanding of this term is at the very heart of your MFL determination.

Your statement concerning flooding as a negative impact is somewhat in the eye of the beholder. Flooding is only a problem when man is somehow negatively impacted. Why do we allow man to be negatively impacted? Isn't it better to live with a river's normal variations? Why do we allow activities that intensify high water flows such as filling in low areas and the construction of drainage ditches and then act shocked when we have too much water and /or poor quality water?

MFL's have nothing to do with balancing water supply and environmental protection. They only address situations where man's action cause harm. My definition of "significant harm" is measurable harm. This is in contrast to what is referred to as de minimis harm or trivial, unmeasurable harm.

The SFWMD doesn't even use MFL determinations let alone some meaningless and arbitrary 15 percent loss of habitat. They prefer the concept of "water reservations".

The natural high and low flows of rivers are as important to maintaining a proper riverine ecology as fire is to upland vitality.

As I said before, thank you for responding to my email, but all you have given me is the same old song and dance. One would get the impression that only the law stands between the complete gutting of the environment to supply water to whoever wants it and some meager, half hearted effort to "balance" the protection of the environment.

Edward McDonald
Auburndale, FL

On Wednesday, August 1, 2018 02:46:44 PM EDT, Doug Leeper <Doug.Leeper@swfwmd.state.fl.us> wrote:

Mr. MacDonald:

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Doug Leeper

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doug.leeper@watermatters.org

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Edward McDonald

Auburndale, FL

From:	Edward Mc Donald
To:	Doug Leeper
Subject:	Minimum flows and Levels
Date:	Monday, August 27, 2018 11:21:33 AM

Mr. Leeper,

I have been reading the April 2010 final Report for the MFL for the Lower Peace River and Shell Creek. Based on that reading I have several very basic questions:

1. The report talks about a five year reassessment. Was that done and is it available?

2. There are many plots and graphs concerning flowrates and rainfall contained in this document, where can I find the raw data for flowrates and rainfall that was used to generate these plots and graphs?

Thanks for your help.

Edward McDonald
Auburndale, FL

From: FootPrintsPRR
To: Doug Leeper
Subject: SWFWMD Public Records Request - Edward McDonald - Minimum Flows and Levels Public Records Request...
Date: Wednesday, August 29, 2018 8:42:32 AM

When replying, type your text above this line.

Notification of Issue Registration

Workspace: Public Records Request
Issue: Edward McDonald - Minimum Flows and Levels Public Records Request
Issue Number: 28248

Priority: Medium **Status:** Under 7 days old
Date: 08/29/2018 **Time:** 08:41:56
Created By: Shellie Ferreira-Lee

Description:
Entered on 08/29/2018 at 8:41:56 AM EDT (GMT-0400) by Shellie Ferreira-Lee:
Will forward email with request.

Current Assignees: Document Services

CC(s): (this edit only) doug.leeper@swfwmd.state.fl.us, ron.basso@swfwmd.state.fl.us, sky.notestein@swfwmd.state.fl.us, brian.starford@swfwmd.state.fl.us, adrienne.vining@swfwmd.state.fl.us

Issue Information:

Internal Request: Off

Contact Information:

Last Name: McDonald **First Name:** Edward
Email Address: emcdotomb@yahoo.com

From:	Doug Leeper
To:	Shellie Ferreira-Lee
Cc:	FootPrintsPRR; Xinjian Chen; Sky Notestein
Subject:	RE: SWFWMD Public Records Request - Edward McDonald - Minimum Flows and Levels Public Records Request...
Date:	Friday, August 31, 2018 1:43:00 PM
Attachments:	2048 Email from EMcDonald-Minimum flows and Levels.pdf

Shellie:

As we discussed, I plan to send Mr. McDonald an email with the 2015 5-year assessment for the lower Peace River minimum flows that he has requested (his original email request is attached).

I'll also let him know about the likely issues involved with locating the hydrologic data associated with the 2010 lower Peace River minimum flows report that he has requested, noting that I may not be able to identify the specific data sets he has requested and will instead send all historical files that I can find from former staff files. I'll also note that this latter information will be considered a public records request and may incur a cost for staff time to search for, compile and provide the files. I'll let him know that he will be receiving an email from you that identifies the potential costs associated with the records request.

I estimate that it may take me up to **4 hours** to search retired staffer folders and copy/compile files relevant to Mr. McDonald's request. Xinjian Chen likely also has hydrologic files associated with the 2010 lower Peace River report, so he will have to also provide you with a time estimate for the potential records request.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org

From: FootPrintsPRR
Sent: Wednesday, August 29, 2018 8:42 AM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: SWFWMD Public Records Request - Edward McDonald - Minimum Flows and Levels Public Records Request...

When replying, type your text above this line.

Notification of Issue Registration

Workspace: Public Records Request
Issue: Edward McDonald - Minimum Flows and Levels Public Records Request
Issue Number: 28248

Priority: Medium **Status:** Under 7 days old
Date: 08/29/2018 **Time:** 08:41:56
Created By: Shellie Ferreira-Lee

Description:
Entered on 08/29/2018 at 8:41:56 AM EDT (GMT-0400) by Shellie Ferreira-Lee:
Will forward email with request.

Current Assignees: Document Services

CC(s): (this edit only) doug.leeper@swfwmd.state.fl.us, ron.basso@swfwmd.state.fl.us, sky.notestein@swfwmd.state.fl.us, brian.starford@swfwmd.state.fl.us, adrienne.vining@swfwmd.state.fl.us

Issue Information:

Internal Request: Off

Contact Information:

Last Name: McDonald **First Name:** Edward
Email Address: emcdotomb@yahoo.com

From:	FootPrintsPRR
To:	Doug Leeper
Subject:	SWFWMD Public Records Request - Edward McDonald - Minimum Flows and Levels Public Records Request...
Date:	Friday, August 31, 2018 1:48:29 PM
Attachments:	2048 Email from EMcDonald-Minimum flows and Levels.pdf

When replying, type your text above this line.

Notification of Issue Change

The following changes have been made to this Issue: *canRead:agentRoles, Appended a Description, Incoming mail: From: doug.leeper@swfwmd.state.fl.us; To: Shellie.Ferreira@swfwmd.state.fl.us; Cc: FootPrints.PRR@swfwmd.state.fl.us, Xinjian.Chen@swfwmd.state.fl.us, Sky.Notestein@swfwmd.state.fl.us, Added Attachment, Escalated: Notify Assignee of Incoming Email, Escalation email sent: carol.daleo@swfwmd.state.fl.us shellie.ferreira@swfwmd.state.fl.us Valerie.Jordan@swfwmd.state.fl.us peggy.meinhardt@swfwmd.state.fl.us earl.rich@swfwmd.state.fl.us, canRead:allRoles.*

Workspace:	Public Records Request
Issue:	Edward McDonald - Minimum Flows and Levels Public Records Request
Issue Number:	28248

Priority:	Medium	**Status:**	Under 7 days old
Date:	08/31/2018	**Time:**	13:46:23
Creation Date:	08/29/2018	**Creation Time:**	08:41:56
Created By:	Shellie Ferreira-Lee		

Description:

Entered on 08/31/2018 at 1:46:23 PM EDT (GMT-0400) by doug.leeper@swfwmd.state.fl.us:

Shellie:

As we discussed, I plan to send Mr. McDonald an email with the 2015 5-year assessment for the lower Peace River minimum flows that he has requested (his original email request is attached).

I'll also let him know about the likely issues involved with locating the hydrologic data associated with the 2010 lower Peace River minimum flows report that he has requested, noting that I may not be able to identify the specific data sets he has requested and will instead send all historical files that I can find from former staff files. I'll also note that this latter information will be considered a public records request and may incur a cost for staff time to search for, compile and provide the files. I'll let him know that he will be receiving an email from you that identifies the potential costs associated with the records request.

I estimate that it may take me up to 4 hours to search retired staffer folders and copy/compile files relevant to Mr. McDonald's request. Xinjian Chen likely also has hydrologic files associated with the 2010 lower Peace River report, so he will have to also provide you with a time estimate for the potential records request.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272

doug.leeper@watermatters.org<mailto:doug.leeper@watermatters.org>

Entered on 08/29/2018 at 8:46:37 AM EDT (GMT-0400) by Shellie Ferreira-Lee:
Shellie A. Ferreira-Lee
Southwest Florida Water Management District
Records Management Specialist
(352) 796-7211, ext. 4053
shellie.ferreira@watermatters.org

From: Earl C. Rich
Sent: Wednesday, August 29, 2018 8:24 AM
To: Shellie Ferreira-Lee <Shellie.Ferreira@swfwmd.state.fl.us>
Cc: Peggy Meinhardt <Peggy.Meinhardt@swfwmd.state.fl.us>
Subject: FW: Minimum flows and Levels

FYI...

Earl

From: Adrienne E. Vining
Sent: Tuesday, August 28, 2018 10:38 AM
To: Doug Leeper
<Doug.Leeper@swfwmd.state.fl.us<mailto:Doug.Leeper@swfwmd.state.fl.us>>
Cc: Ron Basso <Ron.Basso@swfwmd.state.fl.us<mailto:Ron.Basso@swfwmd.state.fl.us>>; Sky Notestein
<Sky.Notestein@swfwmd.state.fl.us<mailto:Sky.Notestein@swfwmd.state.fl.us>>; Brian Starford
<Brian.Starford@swfwmd.state.fl.us<mailto:Brian.Starford@swfwmd.state.fl.us>>; Earl C. Rich <Earl.Rich@swfwmd.state.fl.us<mailto:Earl.Rich@swfwmd.state.fl.us>>
Subject: RE: Minimum flows and Levels

I would respond to his second question via your first alternative. Please provide all responsive data files within the District's possession, and we can provide the clarification you noted. Please also coordinate this PRR with Shellie so it can be tracked. Thanks.

Adrienne E. Vining
Assistant General Counsel
Southwest Florida Water Management District
7601 U.S. Highway 301 North, Tampa, Florida 33637-6759
813.985.7481 x4658
1.800.836.0797 (Florida only)
813.367.9776 FAX
Adrienne.Vining@swfwmd.state.fl.us<mailto:Adrienne.Vining@swfwmd.state.fl.us>

From: Doug Leeper
Sent: Monday, August 27, 2018 3:35 PM
To: Adrienne E. Vining
<Adrienne.Vining@swfwmd.state.fl.us<mailto:Adrienne.Vining@swfwmd.state.fl.us>>
Cc: Ron Basso <Ron.Basso@swfwmd.state.fl.us<mailto:Ron.Basso@swfwmd.state.fl.us>>; Sky Notestein
<Sky.Notestein@swfwmd.state.fl.us<mailto:Sky.Notestein@swfwmd.state.fl.us>>; Brian Starford
<Brian.Starford@swfwmd.state.fl.us<mailto:Brian.Starford@swfwmd.state.fl.us>>; Earl C. Rich <Earl.Rich@swfwmd.state.fl.us<mailto:Earl.Rich@swfwmd.state.fl.us>>
Subject: RE: Minimum flows and Levels

Adrienne: I just received another email from Ed MacDonald.

The answer to his first question below is “yes.” I can provide the attached Gov Bd recap and report file (note the report file has some typos and includes a draft label) in a response to Mr. MacDonald.

I don't think I can specifically answer/address Mr. MacDonald's second question. I can review relevant Peace River/Shell Creek files/folders of Marty Kelly, Mike Heyl, Sid Flannery and Ron Basso and others, but am nearly 100% sure that I will not be able to tell which files were used for all of the rainfall and flow graphs included in the District's 2010 minimum flows report for the lower Peace River and Shell Creek.

One alternative for addressing his second question would be to indicate that we can, through fulfillment of a public records request, provide all relevant rainfall and flow data files that we can find in appropriate, archived District folders. We should, however, make it clear that we may not be able to identify which files contain data associated with specific graphs within the 2010 minimum flows report. An alternative could be that we provide a general description of the sources (likely USGS, District and NOAA or NWS databases) of the hydrologic data, and as appropriate direct him to these sources, or in the case of District data, provide them to him directly as fulfillment of a public records request.

Let me know how you want me to proceed regarding Mr. MacDonald's data/information request.

Thanks,

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org<mailto:doug.leeper@watermatters.org>

From: Edward Mc Donald <emcdotomb@yahoo.com<mailto:emcdotomb@yahoo.com>>
Sent: Monday, August 27, 2018 11:20 AM
To: Doug Leeper
<Doug.Leeper@swfwmd.state.fl.us<mailto:Doug.Leeper@swfwmd.state.fl.us>>
Subject: Minimum flows and Levels

Mr. Leeper,

I have been reading the April 2010 final Report for the MFL for the Lower Peace River and Shell Creek. Based on that reading I have several very basic questions:

1. The report talks about a five year reassessment. Was that done and is it available?

2. There are many plots and graphs concerning flowrates and rainfall contained in this document, where can I find the raw data for flowrates and rainfall that was used to generate these plots and graphs?

Thanks for your help.

Edward McDonald
Auburndale, FL

Entered on 08/29/2018 at 8:41:56 AM EDT (GMT-0400) by Shellie Ferreira-Lee:

Will forward email with request.

Current Assignees: Document Services

CC(s): (this edit only) doug.leeper@swfwmd.state.fl.us

Issue Information:

Internal Request: Off

Contact Information:

Last Name: McDonald **First Name:**Edward
Email Address:emcdotomb@yahoo.com

Attachments: 2048 Email from EMcDonald-Minimum flows and Levels.pdf

From:	Doug Leeper
To:	"Edward Mc Donald"
Bcc:	Shellie Ferreira-Lee; Xinjian Chen; Sky Notestein; Adrienne E. Vining; Brian Starford; Ron Basso; Earl C. Rich
Subject:	RE: Minimum flows and Levels
Date:	Friday, August 31, 2018 2:17:00 PM
Attachments:	SWFWMD 2015-Intial reevaluation of the MFLs fo.pdf

Mr. McDonald:

I'm pleased to inform you that the initial reevaluation of minimum flows established for the lower Peace River that you asked about in your August 27th email (see below) was completed in 2015 and is attached to this email.

Addressing your request for hydrologic data associated with the "many plots and graphs" concerning flow rates and rainfall included in the District's 2010 report on minimum flows for the Lower Peace River and Shell Creek will be somewhat more difficult than providing the attached reevaluation report. Based on the number of figures associated with hydrologic data in the 2010 minimum flows report and the retirement of all District staff that worked on development of that report, I do not think that I will be able to identify the specific files associated with the report figures. At best, I can try to identify all potentially relevant files within the archived folders of my retired colleagues that contain hydrologic data that may have been used to generate information shown in the 2010 report figures.

Please note that the compilation of these hydrologic data files would be considered a public records request and may be associated with a cost to you for District staff time associated with searching for, retrieving and distributing files to you to fulfill your request. Once staff have determined the potential cost associated with fulfilling your request, you will be informed of the cost along with an inquiry regarding whether you want the District to continue working on your request.

Thanks again for your interest in the Peace River. Let me know if you have any questions regarding the information I've provided in/with this email or other water management issues.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org

From: Edward Mc Donald <emcdotomb@yahoo.com>
Sent: Monday, August 27, 2018 11:20 AM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Minimum flows and Levels

Mr. Leeper,

I have been reading the April 2010 final Report for the MFL for the Lower Peace River and Shell Creek. Based on that reading I have several very basic questions:

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2. There are many plots and graphs concerning flowrates and rainfall contained in this document, where can I find the raw data for flowrates and rainfall that was used to generate these plots and graphs?

Thanks for your help.

Edward McDonald
Auburndale, FL

From:	Sid Flannery
To:	Eric DeHaven; Doug Leeper; Sky Notestein; Jennette Seachrist; Darrin Herbst; Cindy C. Rodriguez; Joel B. Brown; Ron Basso
Subject:	DRAFT tables and figures for Flannery memo to the District
Date:	Wednesday, August 29, 2018 7:02:27 AM
Attachments:	Flannery - Peace_Alafia Memo Tables and Figures DRAFT 08-29-18.pdf

Hello District staff,

I am preparing a technical memorandum I plan to submit to the District within the next two weeks regarding a watershed-wide approach for evaluating new surface water withdrawals from either the Peace or Alafia Rivers. In preparing this memorandum I updated rainfall and streamflow data through 2017.

Attached are the draft tables and figures to give you a bit of perspective on the memo. I may add a table or figure or two, but I think this is pretty much it for those. You will receive the draft text within two weeks.

I will first submit my memorandum to the District for review and then I will send a final to the Peace River Manasota Regional Water Supply Authority and the Polk Regional Water Cooperative for their consideration.

I would like to get it to those other two parties as soon as practical before a meeting is held about possible mediation of the water use permit challenge. When that meeting has been scheduled, would Eric and/or Cindy please let me know when the date of that meeting will be.

Thank you and have a fine day,

Sid Flannery

DRAFT – August 29, 2018, subject to revision

Tables and Figures for a technical memorandum being written by Sid Flannery regarding a watershed-wide approach for the evaluation of possible new surface water withdrawals from the Peace and Alafia Rivers

Tables - pages 1 – 4

Figures - Pages F-1 to F-25

Tables

Table 1. Drainage areas, gage locations and average values for flow and area-based runoff for four long-term streamflow gages on the main stem of the Peace River for 1975 to 2017				
	Drainage area and location of gage		Average Flow and Runoff	
USGS gage	Drainage area (mi^2)	Distance from the river origin (miles)	Mean Flow (cfs)	Area Based Runoff (cfs/mi2)
Peace River nr. Bartow	390	2	177	0.45
Peace River at Ft. Meade	480	15	195	0.41
Peace River at Zolfo Springs	826	38	496	0.60
Peace River at Arcadia	1,367	71	890	0.65
Peace River at Shell Creek confluence*	2,090	98	1,547	0.74

* Sum of draingae areas and gaged flows from the Peace River at Arcadia and Horse, Joshua, and Shell Creeks corrected for withdrawals from Shell Creek by the City of Punta Gorda

Table 2. Percentile values for daily flows at four long-term streamflow gages on the main stem of the Peace River for 1975 to 2017									
	Flow Percentiles (cfs)								
USGS gage	Minimum	P5	P10	P25	P50	p75	p90	p95	Maximum
Peace River at Bartow	0	6	9	20	51	183	468	758	4,010
Peace River at Ft. Meade	0	3	6	22	73	214	547	871	2,450
Peace River at Zolfo Springs	4	35	53	108	244	564	1,210	1,840	10,300
Peace River at Arcadia	6	56	82	154	376	981	2,310	3,540	21,700
Peace River at Shell Creek confluence*	18	93	140	269	648	1,686	4,036	6,039	37,567

* Sum of gaged flows from Peace River at Arcadia and Horse, Joshua and Shell Creeks corrected for withdrawals by the City of Punta Gorda

Table 3. Drainage areas, gage locations, average values for flow and area-based runoff and median flows for five major tributaries to the Peace River for 1975 to 2017 or as noted.

USGS gage	Drainage area (mi^2)	Location relative to gages on the river	Mean Flow (cfs)	Area-Based Runoff (cfs/mi2)	Median Flow (cfs)
Payne Creek nr. Bowling Green *	121	Between Ft.Meade and Zolfo Springs	122	1.00	64
Charlie Creek nr. Garner	330	Between Zolfo Springs and Arcadia	243	0.74	53
Horse Creek nr. Arcadia	218	Downstream of Arcadia	170	0.78	40
Joshua Creek nr. Nocatee	132	Downstream of Arcadia	112	0.85	34
Shell Creek nr. Punta Gorda**	371	Downstream of Arcadia	368	0.99	141

* for 1987 to 2017 ** corrected for withdrawals by City of Punta Gorda

Table 4. Results of trend tests of yearly flow statistics (means, P5, median, and P90 flows) for three long-term gages on the Peace River for the period 1940 to 2017. Results are presented for (A) the non-parametric Mann-Kendall test and (B) linear regression of each yearly flow statisitc as a function of year. P is the probability of type 1 error or that there is no trend. P values less than 0.10 are highlighted in bold.

	A. Mann-Kendall		B. Linear Regression			
Gage and yearly statistic tested for trend	Tau	p	Slope cfs per year	p	Slope as % of mean value	Slope as % of median value
Average Yearly Flows						
Bartow (1940-2017)	-0.227	**0.0032**	-2.15	**0.0083**	-1.00%	-1.19%
Zolfo Springs (1934-2017)	-0.197	**0.0108**	-4.31	**0.0113**	-0.72%	-0.81%
Arcadia (1932-2017)	-0.139	**0.0760**	-6.42	**0.0274**	-0.61%	-0.64%
Yearly P5 (Low) Flows						
Bartow (1940-2017)	-0.416	**<0.0001**	-0.57	**0.0008**	-2.05%	-3.20%
Zolfo Springs (1934-2017)	-0.397	**<0.0001**	-1.36	**<0.0001**	-1.35%	-1.55%
Arcadia (1932-2017)	-0.282	**0.0003**	-1.27	**0.0034**	-1.01%	-1.20%
Yearly P50 (Median) Flows						
Bartow (1940-2017)	-0.329	**<0.0001**	-2.02	**0.0003**	-1.64%	-2.23%
Zolfo Springs (1934-2017)	-0.247	**0.0014**	-2.97	**0.0036**	-0.88%	-0.99%
Arcadia (1932-2017)	-0.183	**0.0176**	-4.06	**0.0150**	-0.79%	-0.96%
Yearly P90 (High) Flows						
Bartow (1940-2017)	-0.167	**0.0306**	-3.46	**0.0990**	-0.64%	-0.70%
Zolfo Springs (1934-2017)	-0.134	**0.0828**	-6.85	0.1109	-0.49%	-0.58%
Arcadia (1932-2017)	-0.107	0.1674	-13.50	**0.0896**	-0.50%	-0.57%

Table 5. Statistics for days that flow at the Bartow gage exceeded the the flow at the Ft. Meade gage on the Peace River (deficit). The mean deficit for the year is the average deficit between the gages if averaged over the entire year.

Year	Number of days	Mean Deficit	Greatest Daily Deficit	Smallest Daily Deficit	Meann Deficit for Year
	(cfs)				
1975	65	6.9	61	0.2	1.2
1976	42	31.5	185	1.0	3.6
1977	112	10.1	60	0.7	3.1
1978	59	44.2	146	2.0	7.1
1979	120	67.2	320	1.0	22.1
1980	135	30.0	316	1.0	11.1
1981	256	11.7	79	1.0	8.2
1982	143	55.3	420	1.0	21.6
1983	126	68.3	416	1.0	23.6
1984	203	24.2	279	1.0	13.5
1985	197	6.6	25	0.2	3.6
1986	162	22.3	192	0.4	9.9
1987	74	47.4	445	0.3	9.6
1988	45	24.1	89	1.0	3.0
1989	26	37.0	139	0.1	2.6
1990	130	12.4	129	0.3	4.4
1991	190	16.3	338	0.2	8.5
1992	81	36.8	263	0.1	8.2
1993	121	32.8	180	1.0	10.9
1994	159	26.6	178	0.7	11.6
1995	75	32.7	283	1.0	6.7
1996	97	67.3	610	1.0	17.9
1997	166	22.2	166	0.1	10.1
1998	43	3.9	20	0.2	0.5
1999	118	20.8	134	0.4	6.7
2000	263	10.3	51	0.2	7.5
2001	134	3.7	114	0.1	1.4
2002	100	18.8	370	0.0	5.1
2003	41	53.8	240	0.3	6.0
2004	99	331.7	1670	0.1	90.0
2005	40	21.1	56	1.0	2.3
2006	173	4.9	34	0.1	2.3
2007	165	5.1	16	0.0	2.3
2008	227	18.3	175	0.2	11.4
2009	178	5.2	21	0.0	2.5
2010	143	12.0	160	0.0	4.7
2011	200	20.5	527	0.1	11.2
2012	170	8.8	75	0.0	4.1
2013	89	12.2	225	0.1	3.0
2014	136	53.6	562	0.1	20.0
2015	141	75.7	455	0.1	29.2
2016	101	91.1	581	0.6	25.2
2017	103	29.3	236	0.3	8.3

Table 6. Results of trend tests of yearly flow statistics (means, P5, median, and P90 flows) for three long-term gages on the Peace River and Charlie, Horse and Joshua Creeks for the period 1951 to 2017. Results are presented for (A) the non-parametric Mann-Kendall test and (B) linear regression of each yearly flow statisitc as a function of year. P is the probability of type 1 error or that there is no trend. P values less than 0.10 are highlighted in bold.

		A. Mann-Kendall		B. Linear Regression			
Gage and yearly statistic tested for trend		Tau	p	Slope cfs per year	p	Slope as % of mean value	Slope as % of median value
Average Yearly Flows							
Charlie Creek	(1951-2017)	-0.029	0.725	-0.84	0.4060	0.32%	-0.38%
Horse Creek	(1951-2017)	-0.058	0.458	-0.58	0.4110	0.31%	-0.33%
Joshua Creek	(1951-2017)	0.083	0.322	0.03	0.5025	0.02%	0.02%
Peace nr. Bartow	(1951-2017)	-0.184	**0.0276**	-2.30	**0.0270**	1.13%	-1.46%
Peace at Zolfo Springs	(1957-2017)	-0.163	**0.0508**	-4.25	**0.0440**	0.75%	-0.92%
Peace at Arcadia	(1951--2017)	-0.099	0.2366	-5.91	**0.0995**	0.59%	-0.62%
Yearly P5 (Low) Flows							
Charlie Creek	(1951-2017)	-0.041	0.6222	-0.03	0.4510	0.45%	-0.38%
Horse Creek	(1951-2017)	-0.099	0.2360	0.03	0.4616	0.57%	1.02%
Joshua Creek	(1951-2017)	0.500	**<.0001**	0.18	**0.0247**	2.30%	3.20%
Peace nr. Bartow	(1951-2017)	-0.527	**<.0001**	-0.99	**<0.0001**	**3.48%**	**-5.80%**
Peace at Zolfo Springs	(1957-2017)	-0.489	**<.0001**	-2.15	**<0.0001**	**2.12%**	**-2.47%**
Peace at Arcadia	(1951--2017)	-0.369	**<.0001**	-2.20	**<0.0001**	**1.70%**	**-2.12%**
Yearly P50 (Median) Flows							
Charlie Creek	(1951-2017)	-0.099	**0.2380**	-0.72	**0.0940**	0.90%	-1.25%
Horse Creek	(1951-2017)	-0.084	0.3167	-0.44	0.1208	0.79%	-1.15%
Joshua Creek	(1951-2017)	0.281	**0.0008**	0.33	0.1044	1.04%	0.36%
Peace nr. Bartow	(1951-2017)	-0.327	**<.0001**	-2.57	**0.0003**	2.19%	-3.10%
Peace at Zolfo Springs	(1957-2017)	-0.268	**0.0014**	-3.96	**0.0021**	1.19%	-1.36%
Peace at Arcadia	(1951--2017)	-0.204	**0.0144**	-5.87	**0.0056**	1.16%	-1.43%
Yearly P90 (High) Flows							
Charlie Creek	(1951-2017)	-0.022	0.7909	-2.160	0.4900	0.28%	-0.33%
Horse Creek	(1951-2017)	-0.075	0.3719	-1.596	0.4222	0.30%	-0.36%
Joshua Creek	(1951-2017)	0.007	0.4232	0.674	0.5354	0.23%	0.26%
Peace nr. Bartow	(1951-2017)	-0.101	0.2254	-3.030	0.2638	0.59%	-0.76%
Peace at Zolfo Springs	(1957-2017)	-0.082	0.3299	-5.190	0.3370	0.39%	-0.46%
Peace at Arcadia	(1951--2017)	-0.052	0.5373	-10.535	0.2906	0.41%	-0.45%

Figures on the following pages

Figure 1. Map of Peace River watershed showing the main stem of river, major tributaries, and the locations of long-term USGS streamflow gages. Adapted from SWFWMD (2002).

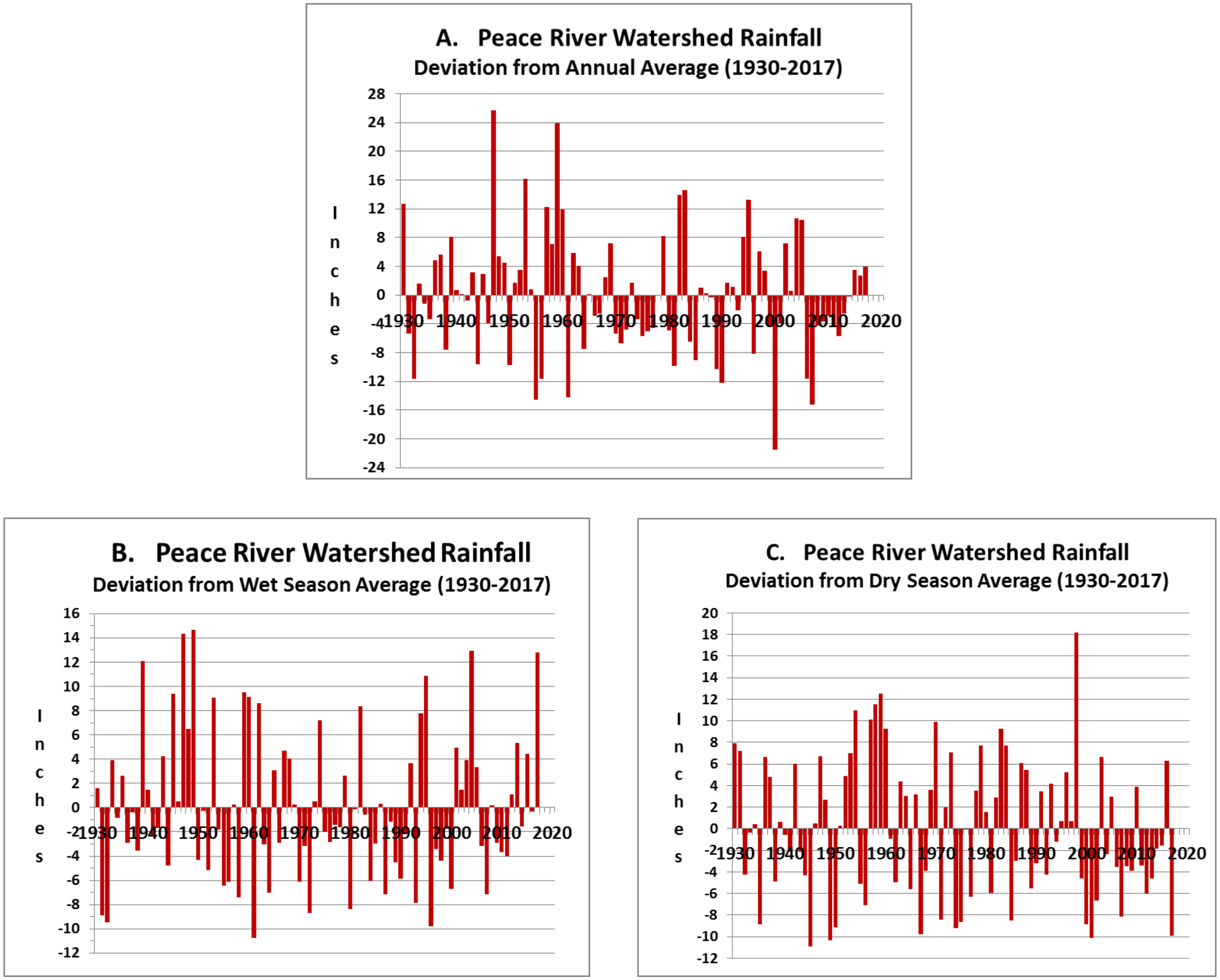


Figure 2. Yearly deviations from: (A) annual average; (B) wet season (June – September); and (C) dry season (October – May) average rainfall totals for the Peace River watershed taken from the regional rainfall summaries available from the Southwest Florida Water Management District website. Average rainfall totals for the 1930 to 2017 are annual - 52.2 inches, wet season - 31.5 inches, and dry season - 20.7 inches.

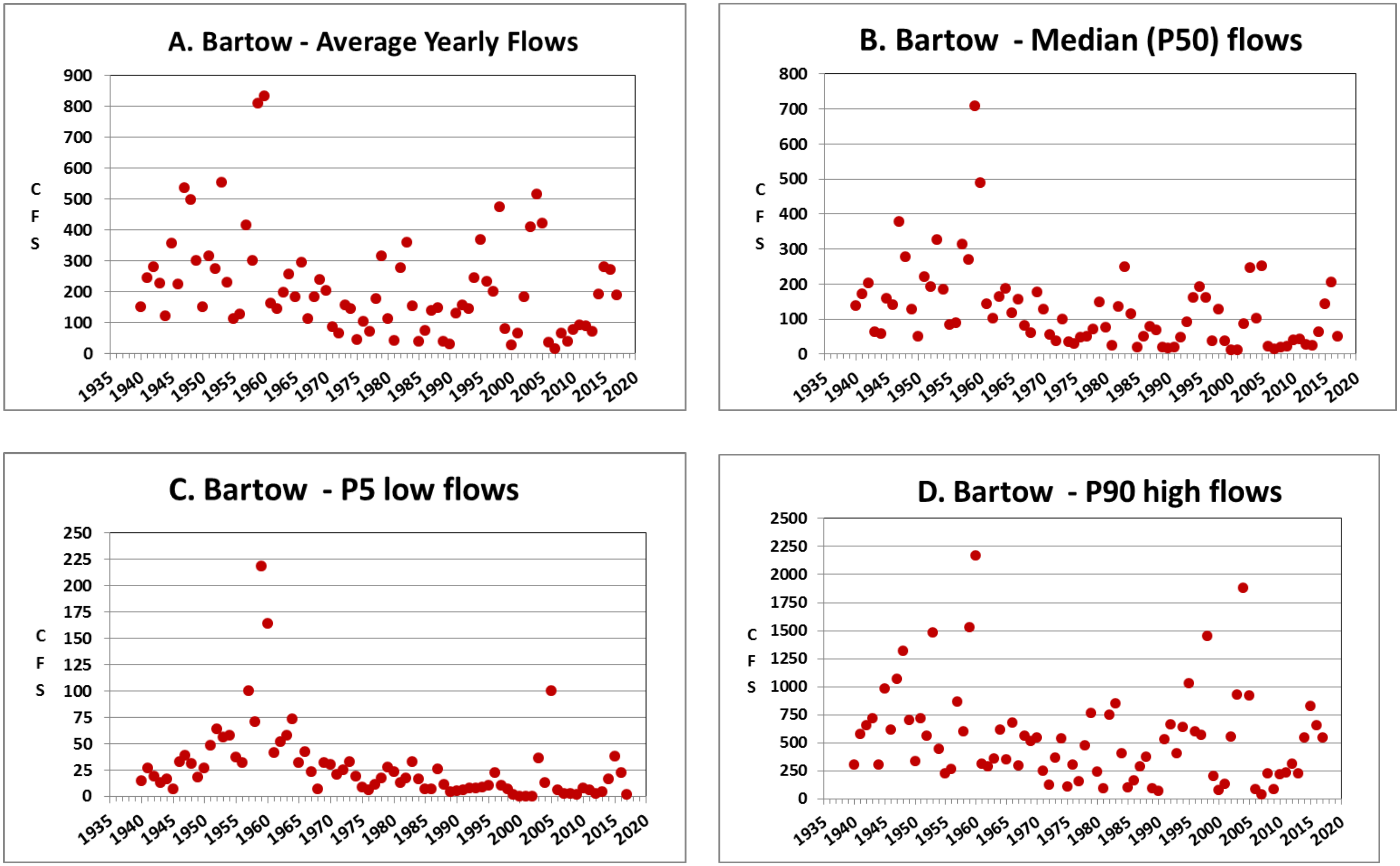


Figure 3. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Bartow gage for 1940 to 2017.

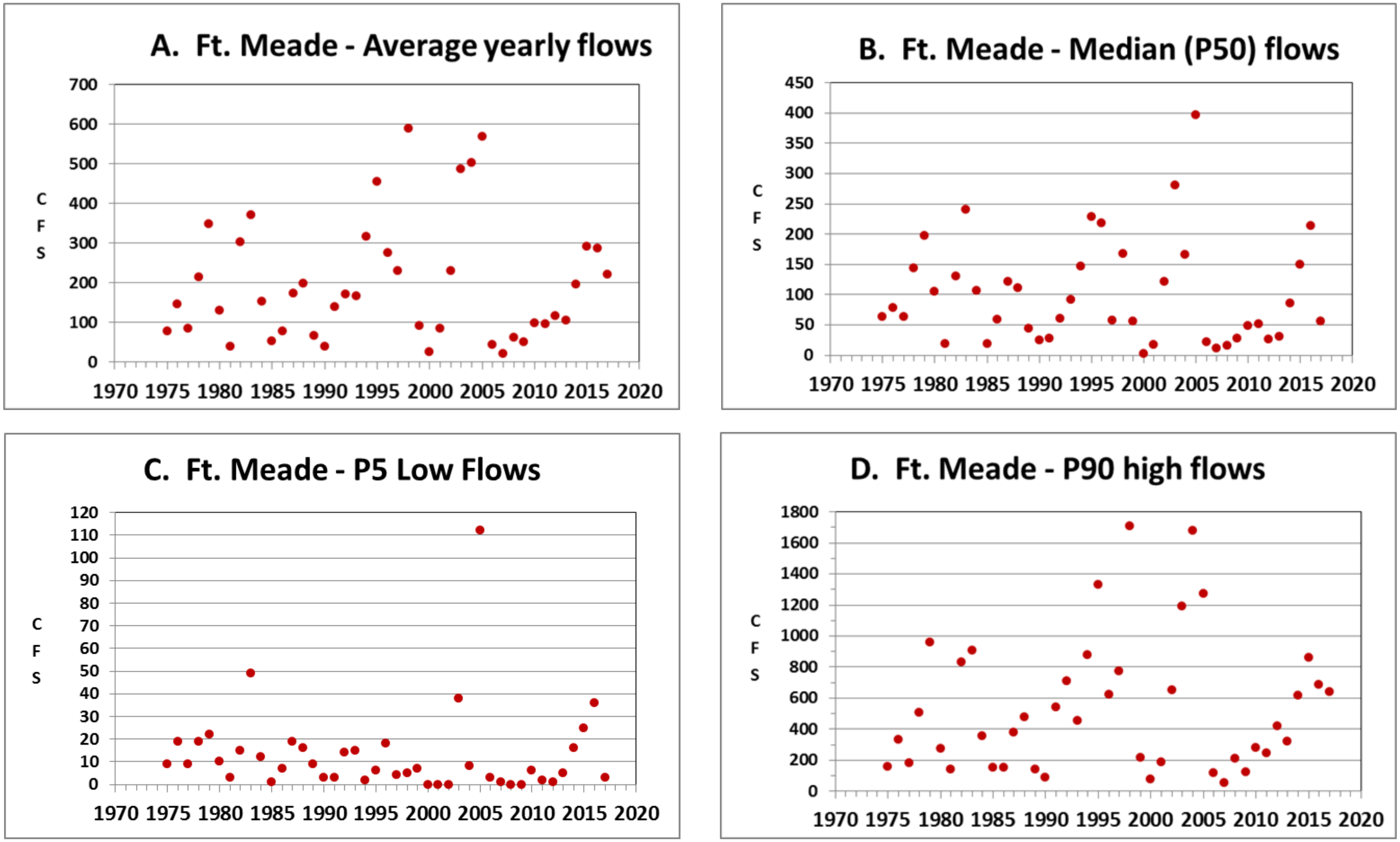
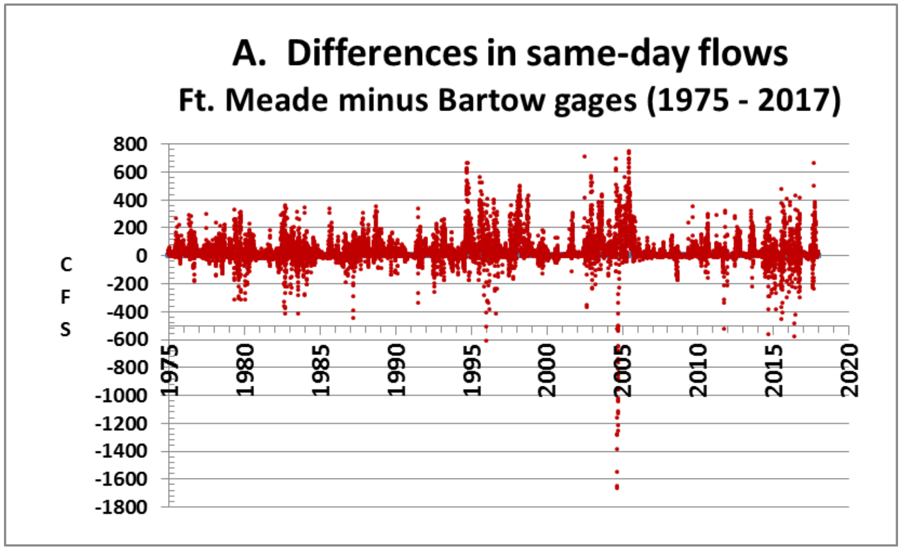


Figure 4. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Ft. Meade gage for 1975 to 2017.



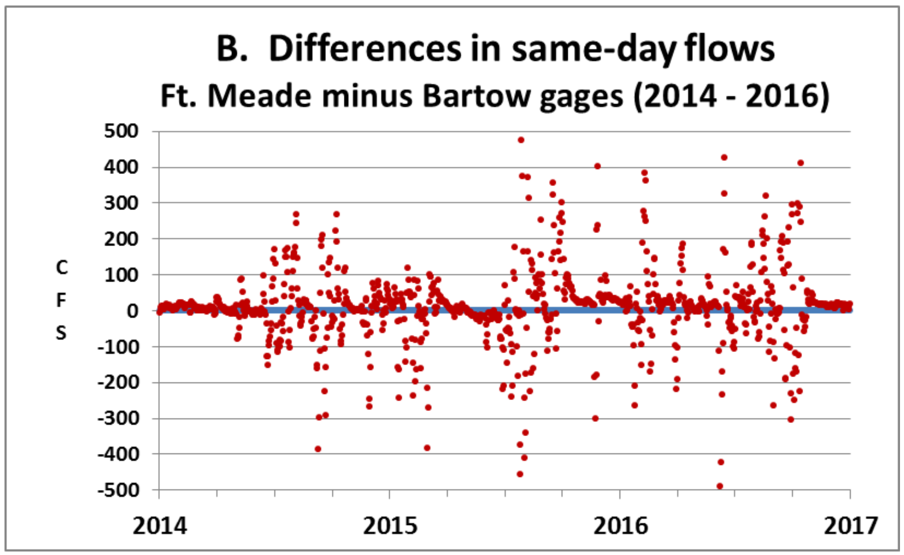


Figure 5. Hydrographs of differences in same-day flows reported by the USGS for the Peace River at Bartow and Peace River at Ft. Meade gages (Ft. Meade minus Bartow) for 1975 – 2017 and 2014 – 2016.

Figure 6. Photographs of locations on the channel of the Upper Peace River between Bartow and Ft. Meade during droughts showing areas with no or very little water. The photograph in the lower right is the channel of the run from the inactive Kissengen Spring.

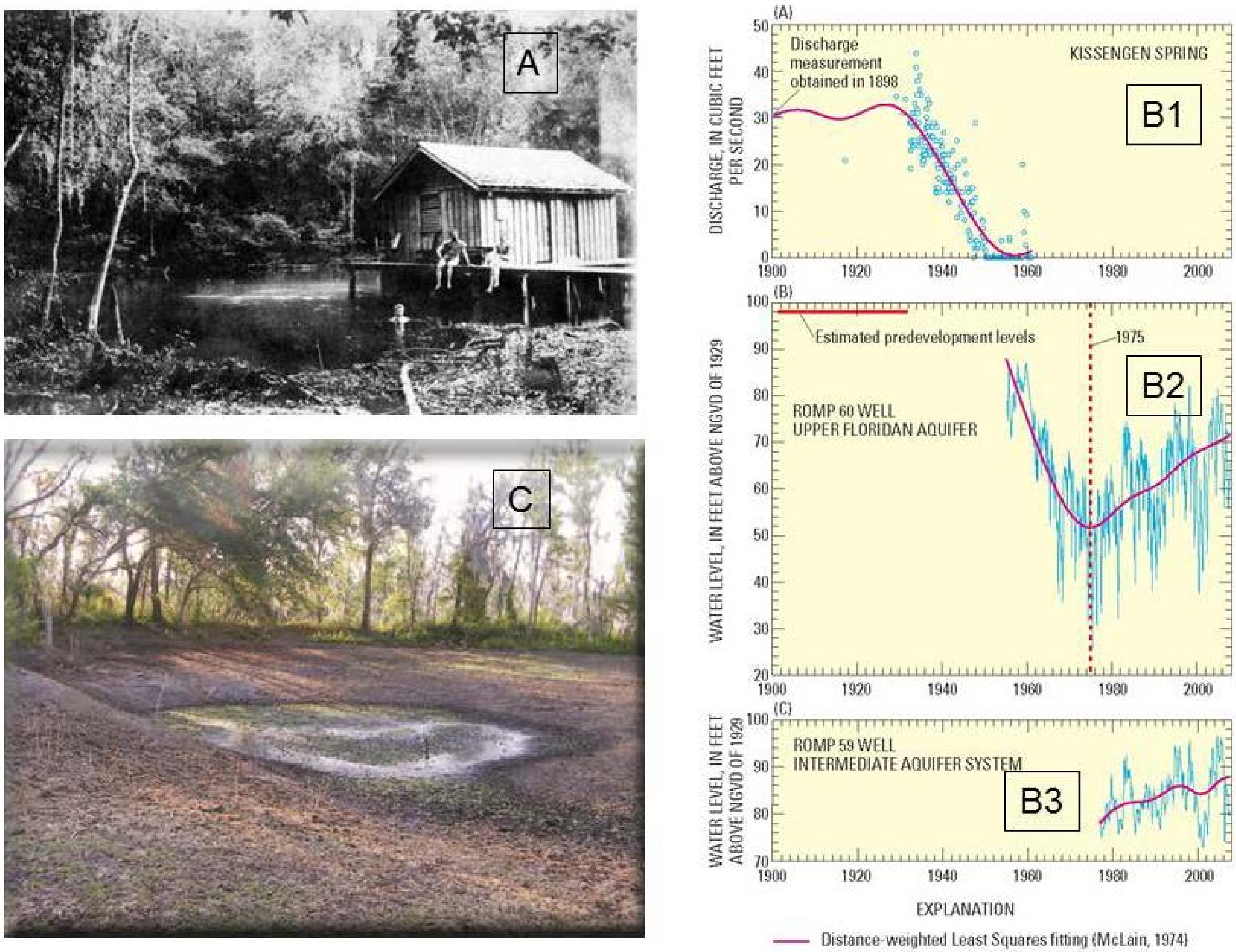


Figure 7. **A - Photograph of Kissengen Spring in 1894. B1 - Discharge from Kissengen Spring, B2- Water levels in Upper Floridan aquifer water levels at the Romp 60 well, and B3 - Water levels in the Intermediate aquifer at the Romp 50 well. C- Photograph of site of inactive Kissgengen Springs during 2006.**

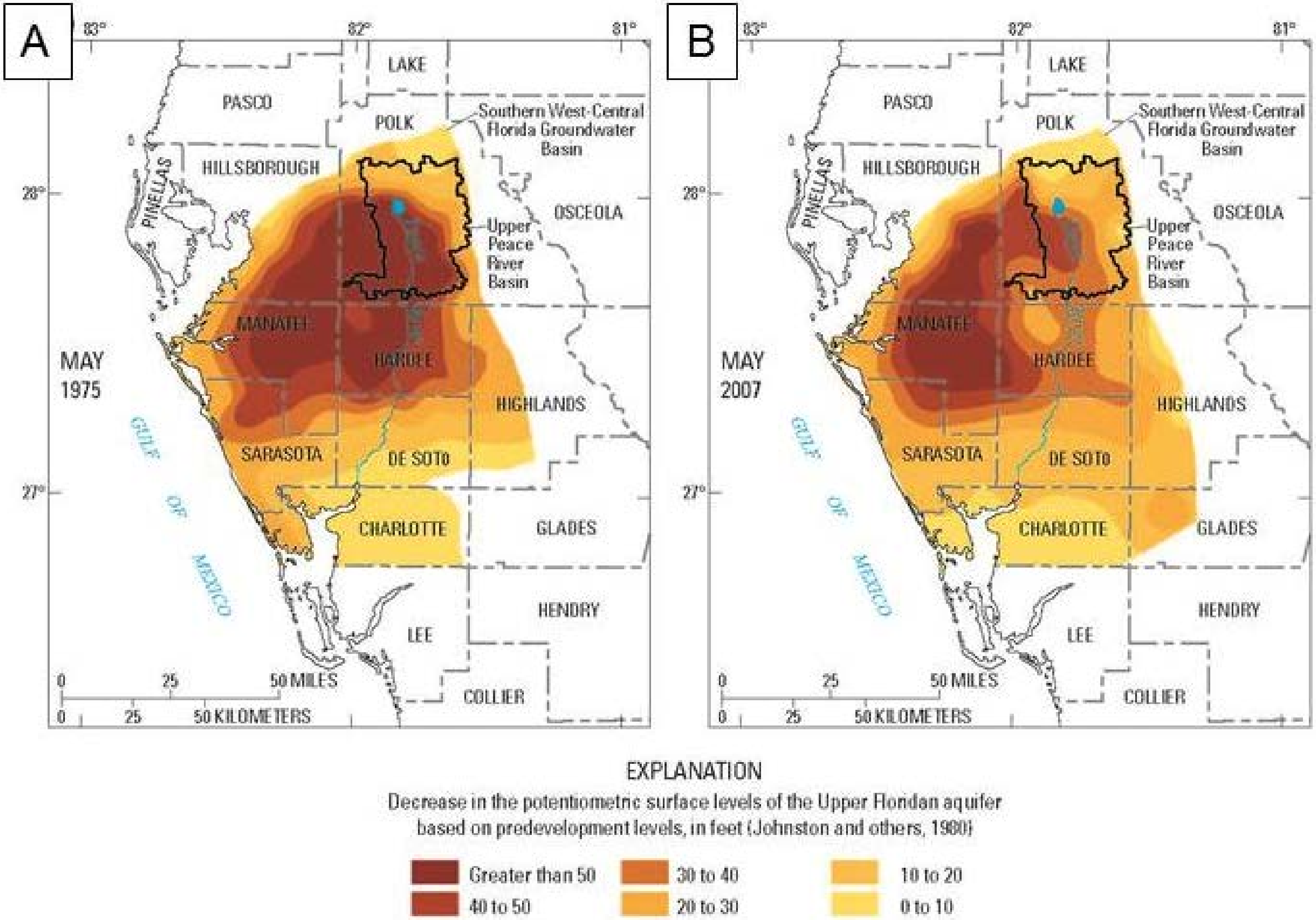


Figure 8. Changes in the potentiometric surface of the Upper Floridan aquifer in the Southern Groundwater Basin from estimated predevelopment conditions to 1975 (A) and 2007 (B). Adapted from Metz and Lewelling (2009).

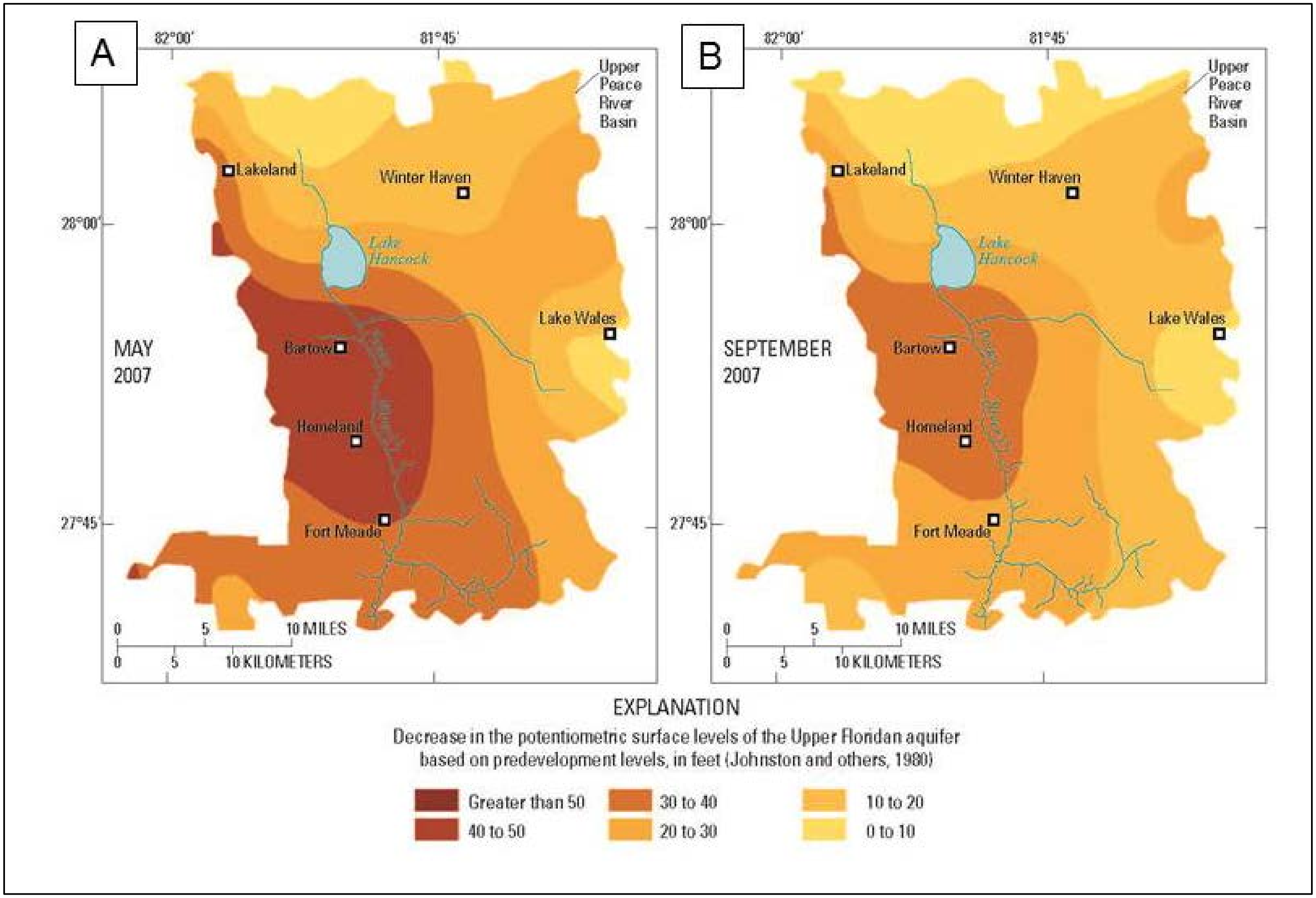


Figure 9. Changes in the potentiometric surface of the Upper Floridan aquifer in the upper Peace River basin from estimated predevelopment conditions and May 2007 (A) and September 2007 (B) levels. Adapted from Metz and Lewelling (2009).

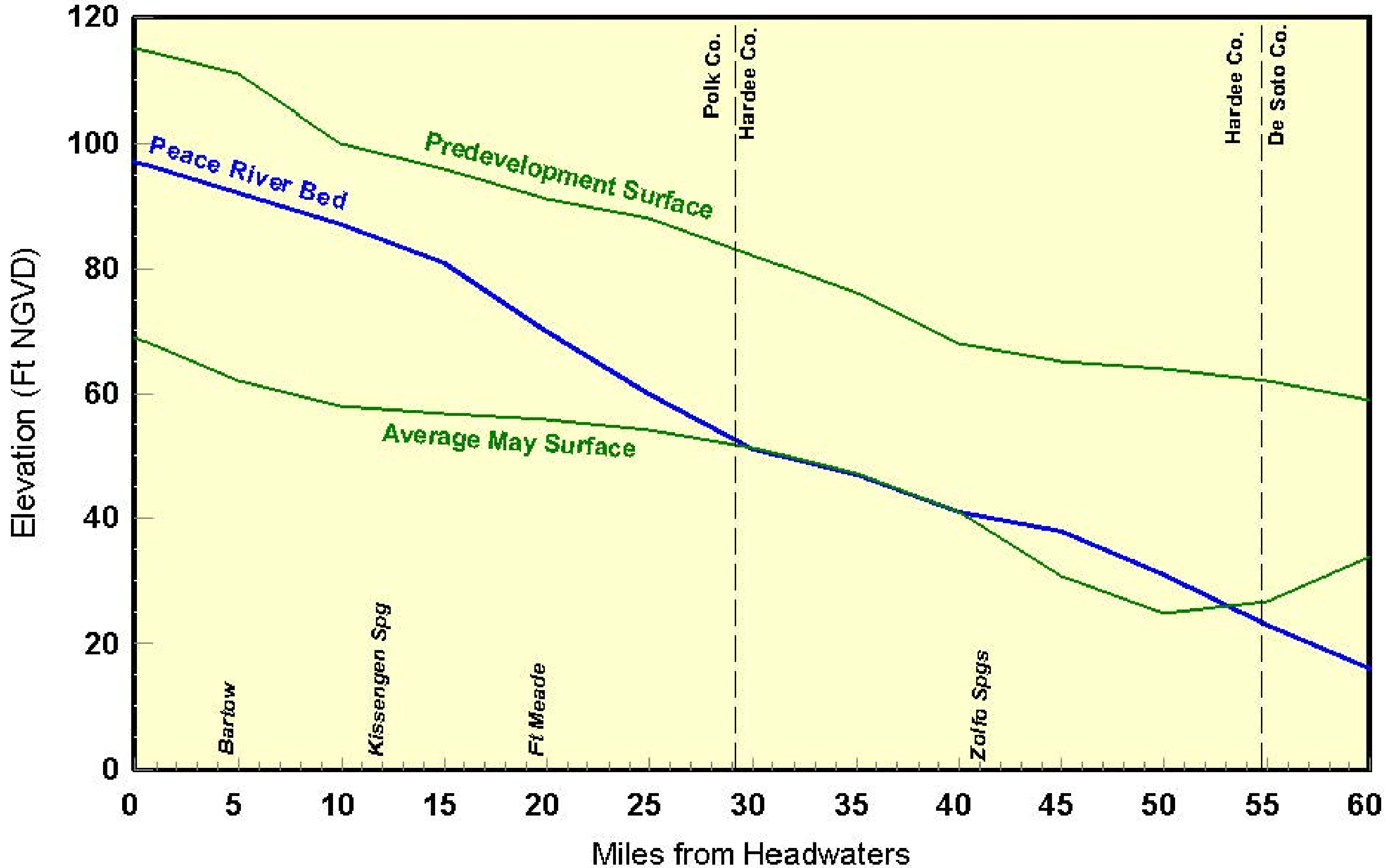


Figure 10. Generalized potentiometric surface of the Upper Floridan aquifer relative to the bed of the channel of Peace River for pre-development conditions and average May conditions for 1989-2002. Reprinted from Basso (2003).

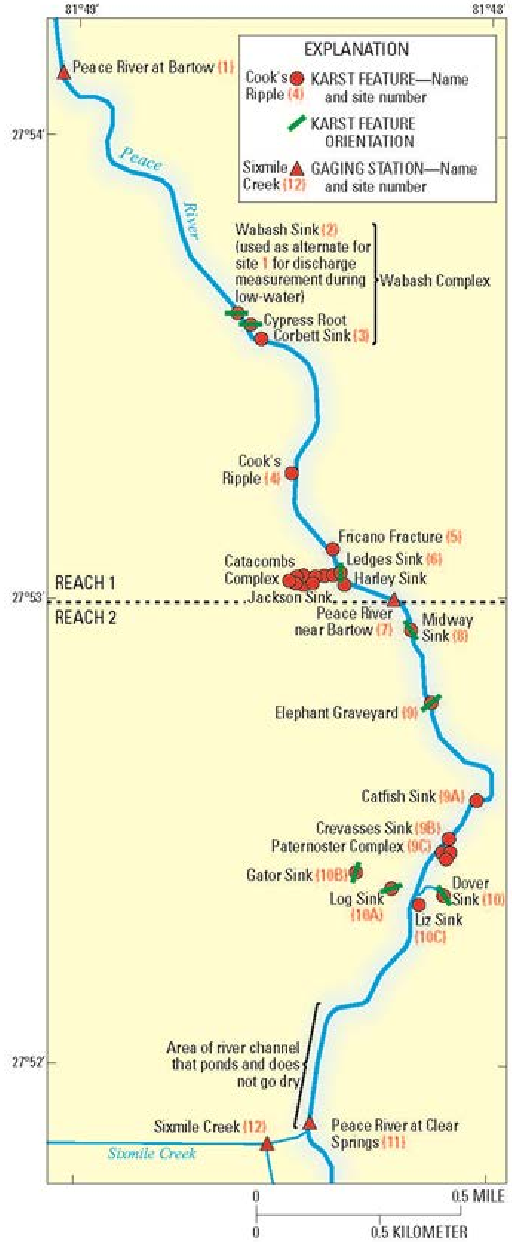


Figure 11. Location of karst features in reaches 1 and 2 of the Upper Peace River. Reprinted from Metz and Lewelling (2009).

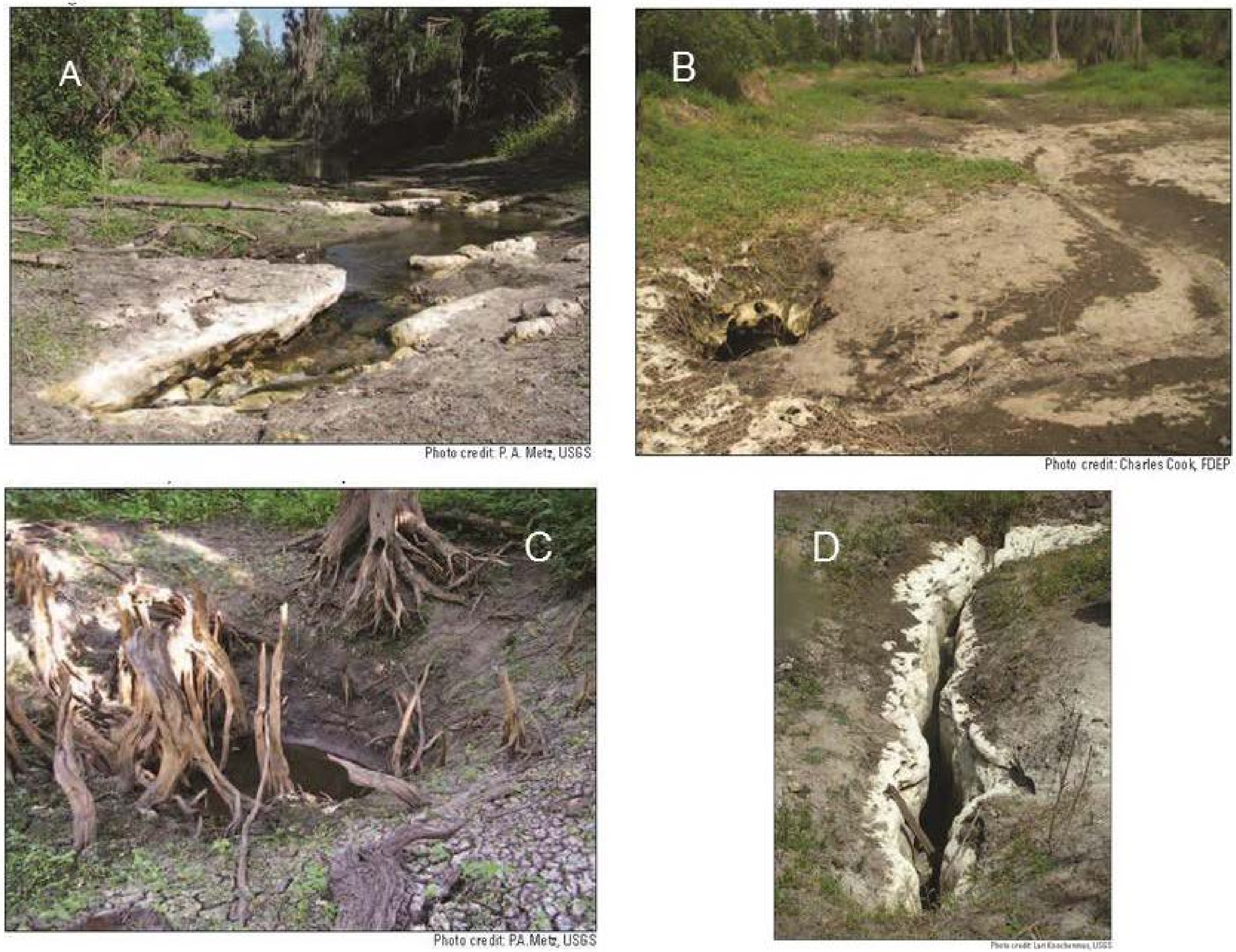


Figure 12. Photographs of sinks in the channel of the Peace River between Bartow and Ft. Meade: (A) Ledges sink; (B) Midway Sink; (C) Cavity near Wabash complex; (D) Crevasses Sink. Adapted from Metz and Lewelling (2009)

Figure 13. Photographs of sinks in the floodplain of the Peace River between Bartow and Ft. Meade: (A) Sink in eastern floodplain; (B) Gator Sink; (C) Dover Sink during dry conditions; (D) Dover Sink with ponded water during high river stage.

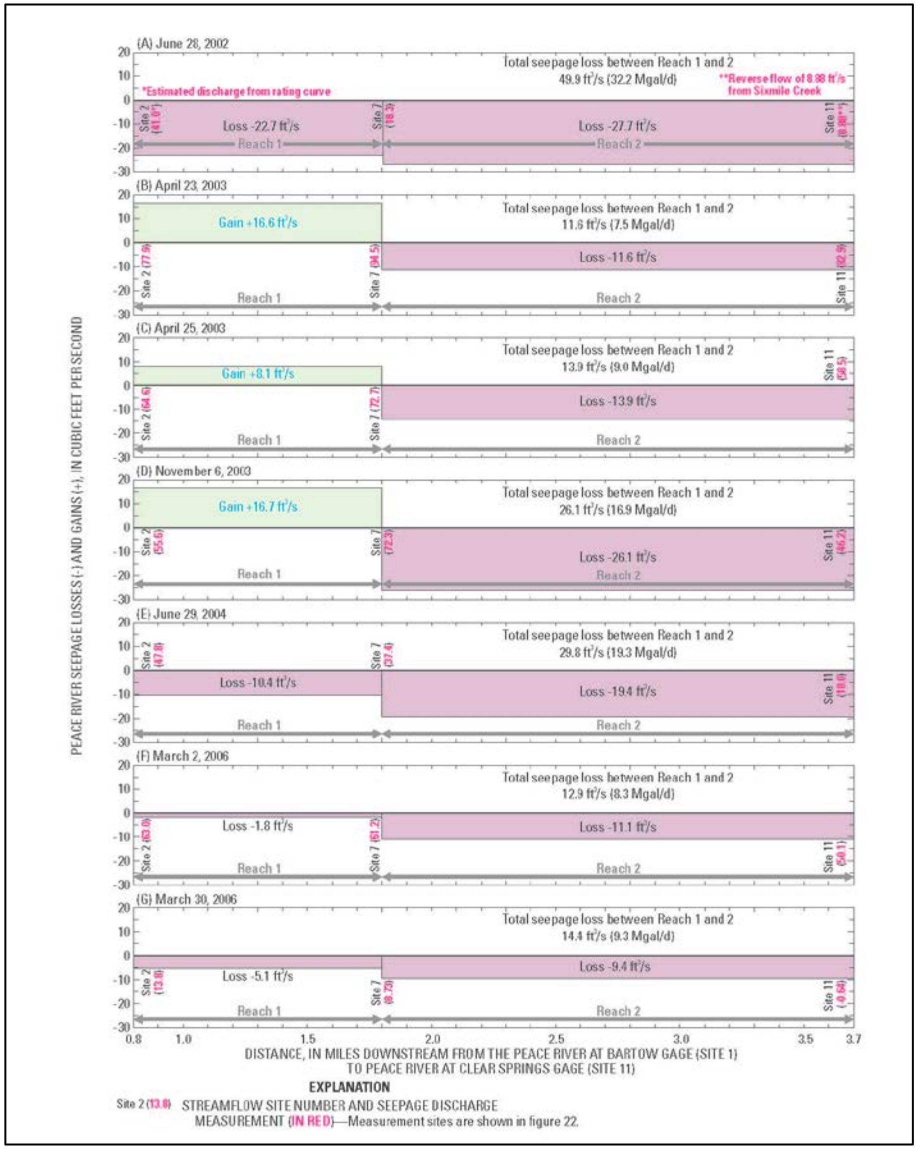


Figure 14. Streamflow gains and losses along reaches 1 and 2 from the Peace River at Wasbash (site 2) to the Peace River at Clear Springs gaging stations (site 11). Reprinted from Metz and Lewelling (2009).

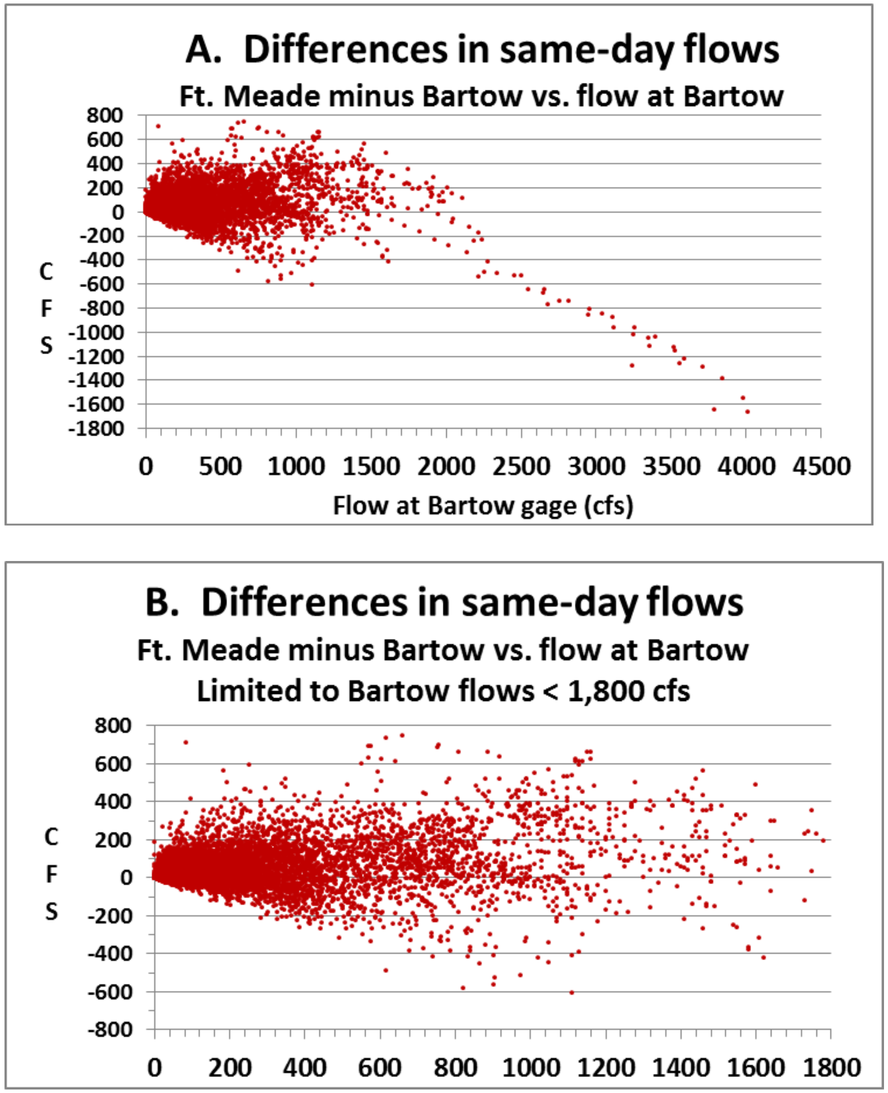


Figure 15. Hydrographs of differences in same-day flows reported by the USGS for the Peace River at Bartow and Peace River at Ft. Meade gages (Ft. Meade flow minus Bartow) versus the flow at Bartow. Hydrograph B is limited to flows at Bartow less than 1,800 cfs for better resolution.

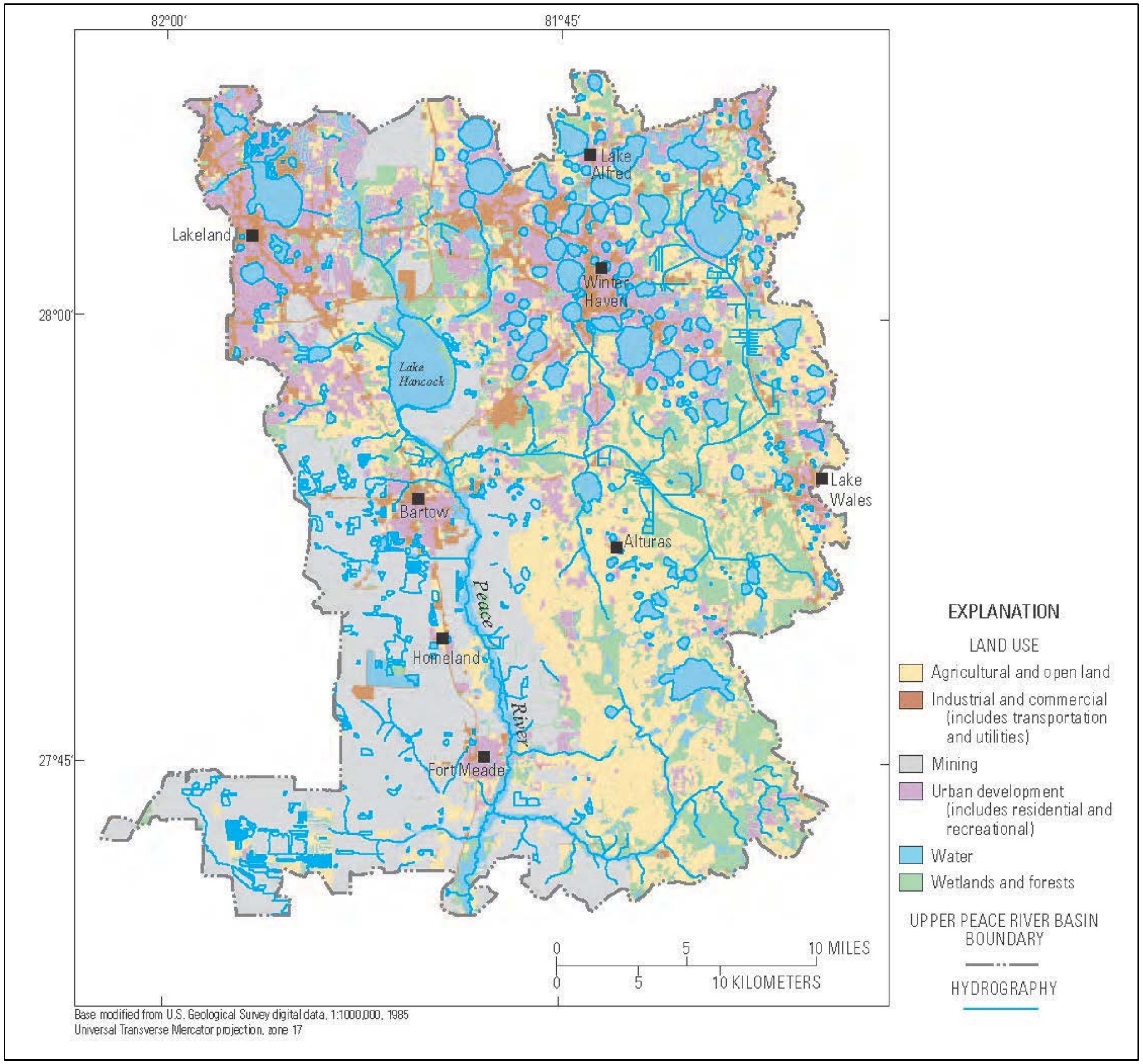


Figure 16. Major Land use categories in the Upper Peace River Basin for 2005. Reprinted from Metz and Lewelling (2009)

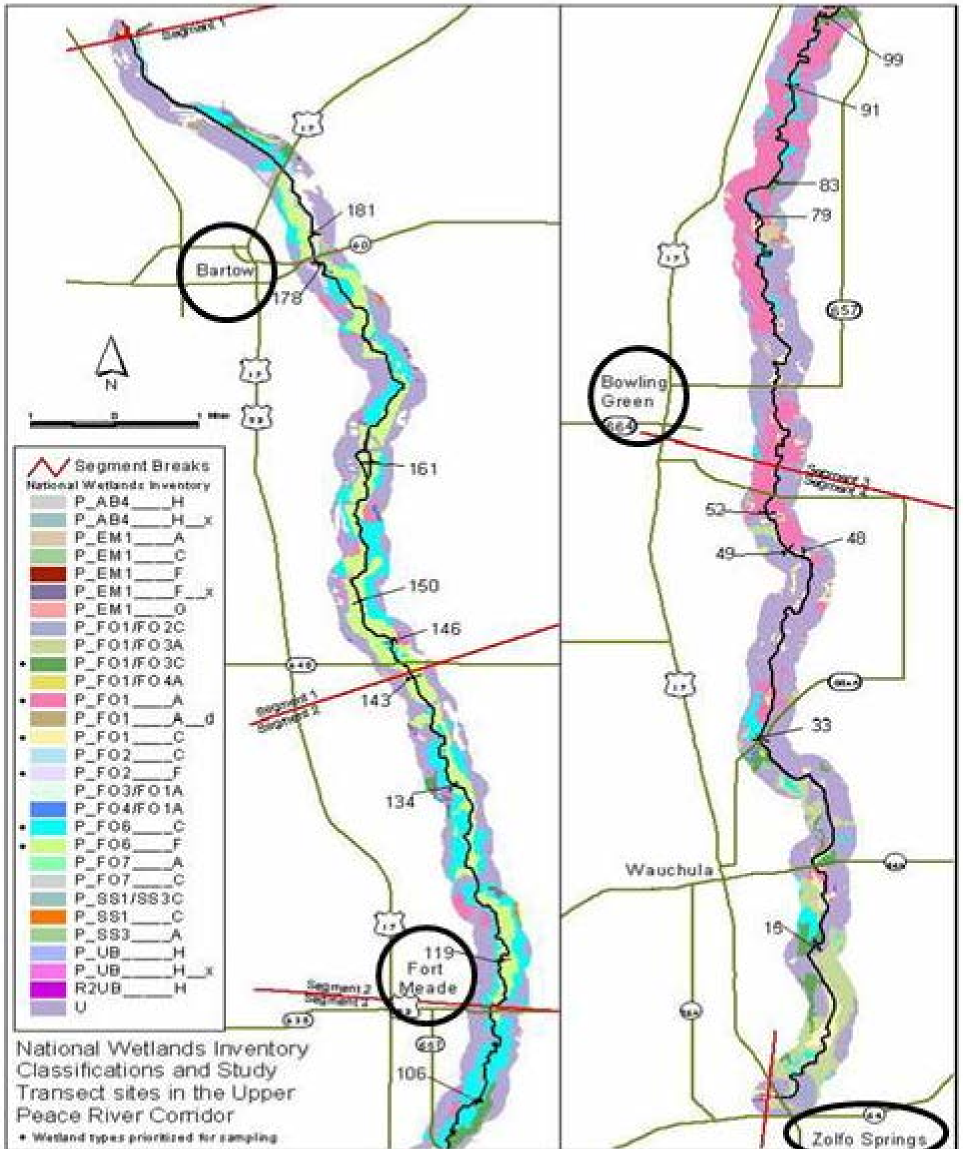


Figure 17. Distribution wetland types classified by the National Wetlands Inventory along the Upper Peace River from the origin of the Peace River above Bartow to Zolfo Springs. Towns are circled for geographic reference. Adapted from SWFWMD (2002).

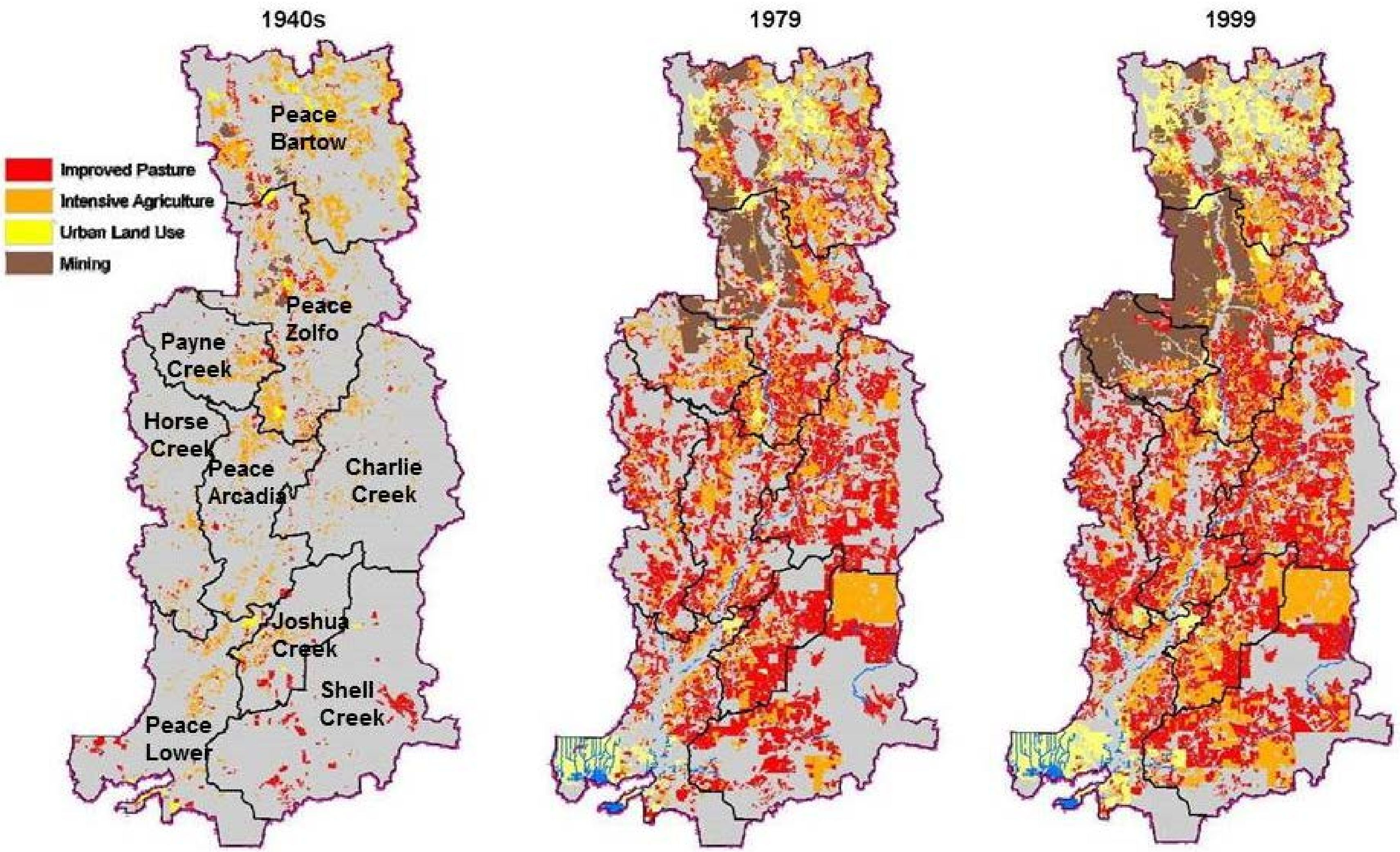


Figure 18. Distribution of major developed land uses in the Peace River watershed for the 1940s, 1979, and 1999. Major sub-basins labeled in the 1940s map for reference. Adapted from PBS&J and others (2007).

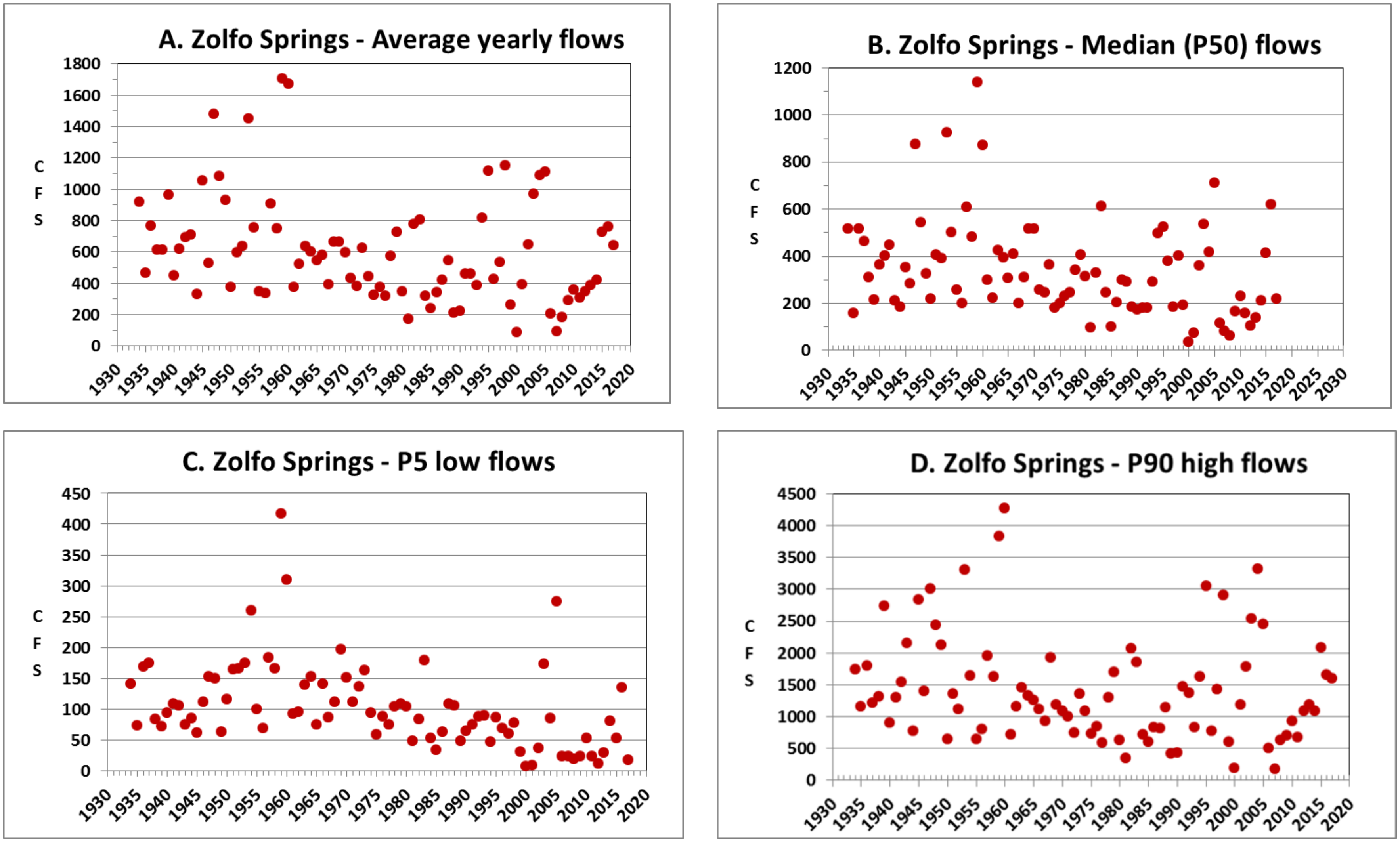


Figure 19. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Zolfo Springs gage for 1934 to 2017.

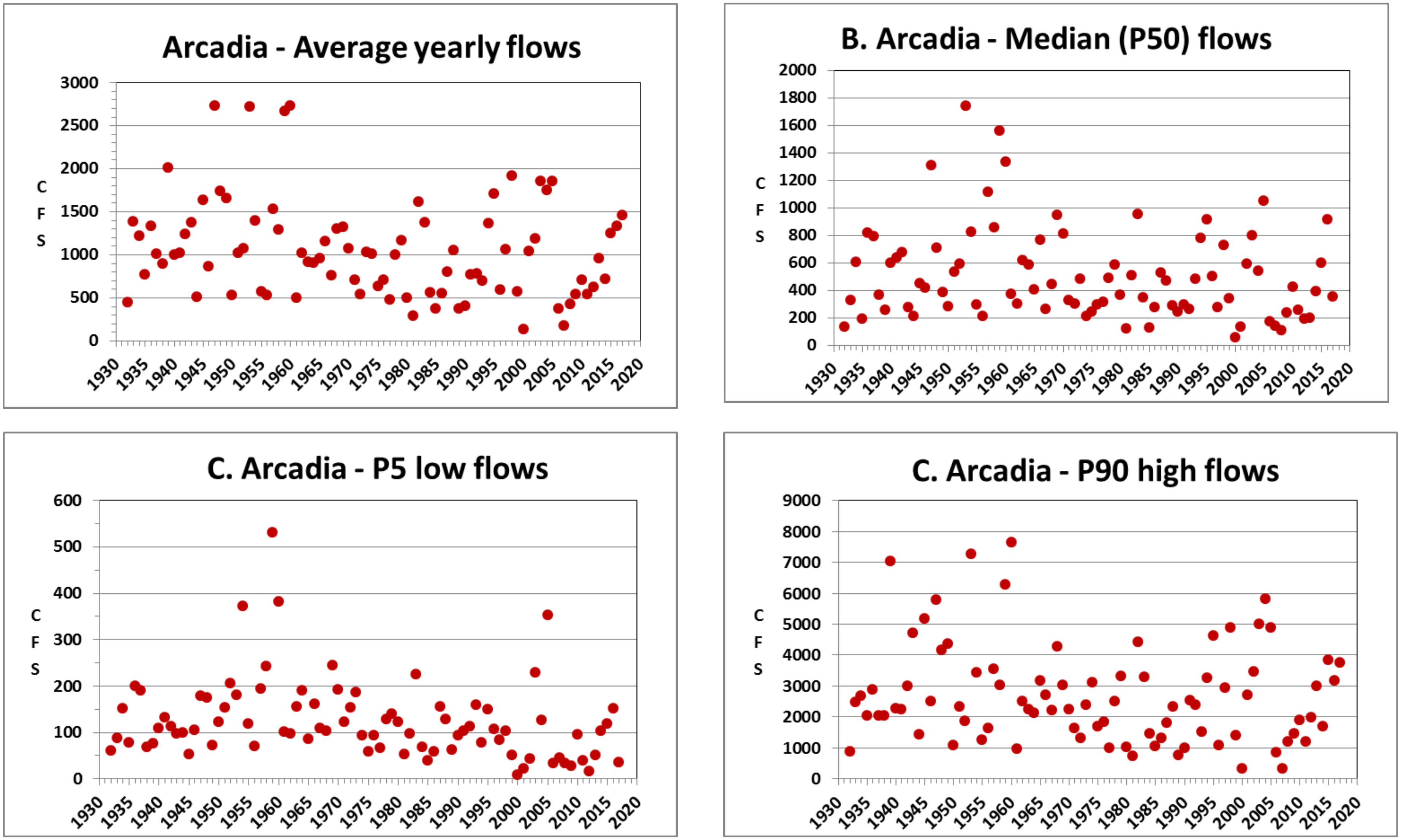


Figure 20. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Arcadia gage for 1931 to 2017.

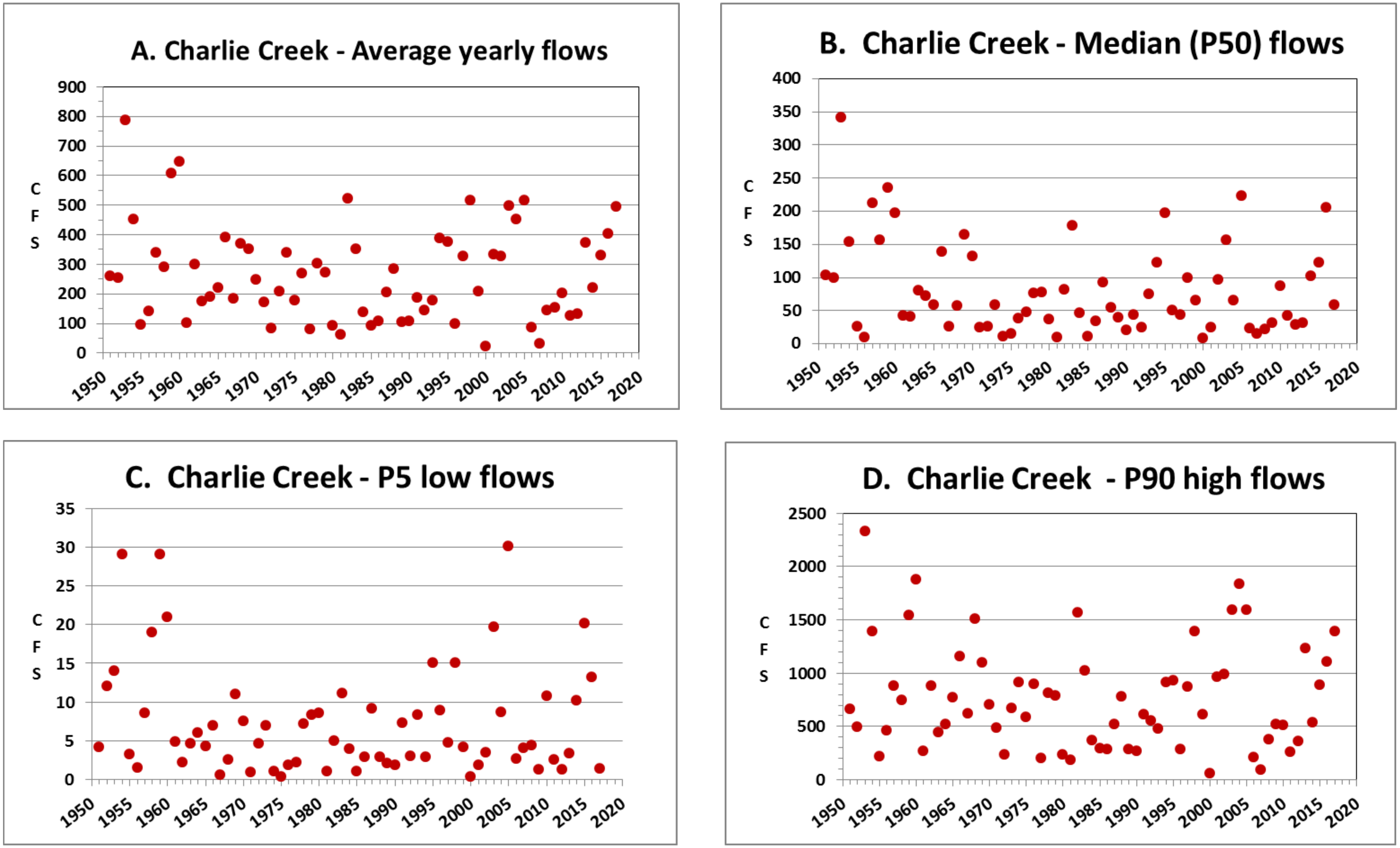


Figure 21. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Charlie Creek near Gardner for 1951 to 2017.

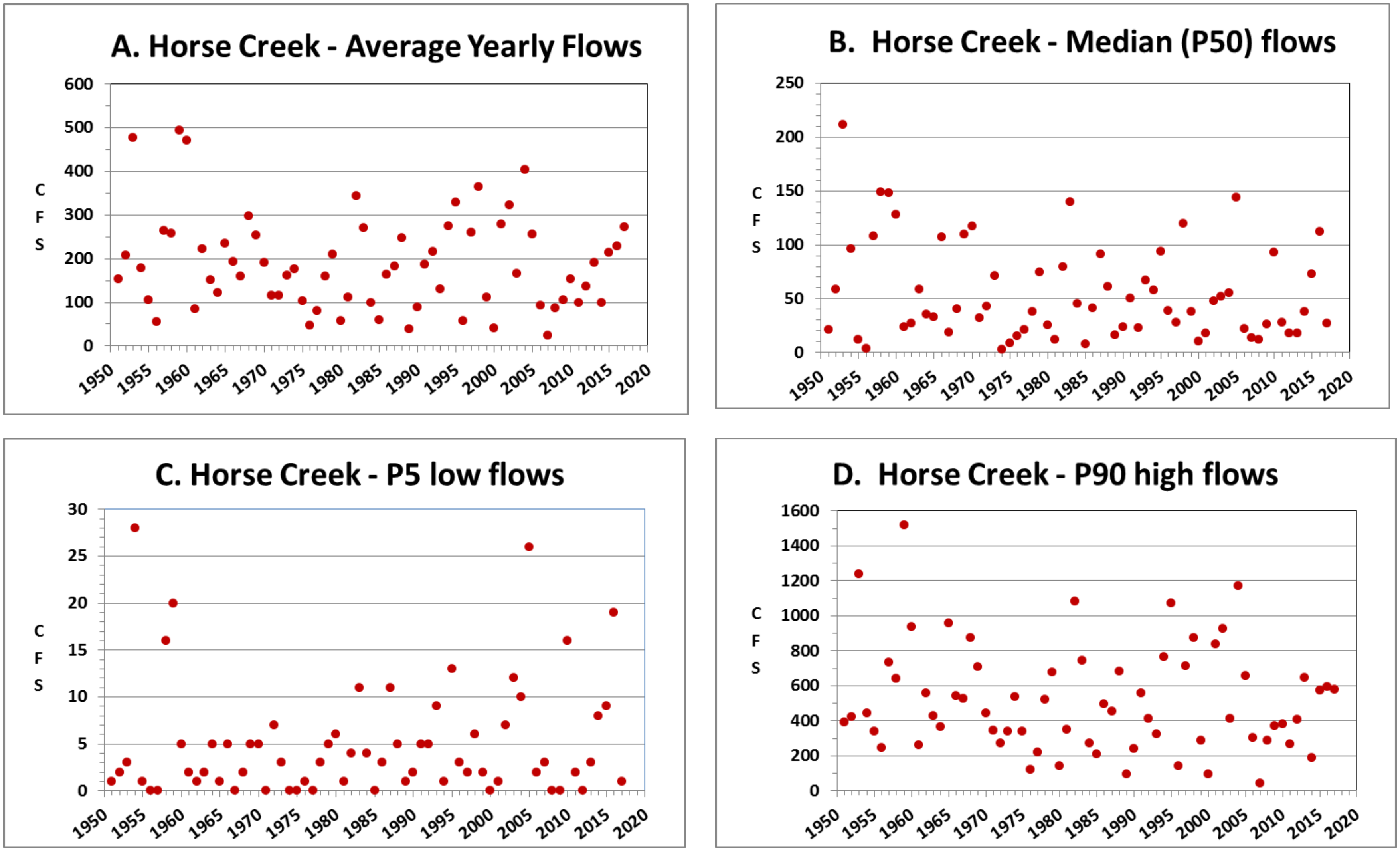


Figure 22. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Horse Creek near Arcadia for 1951 to 2017.

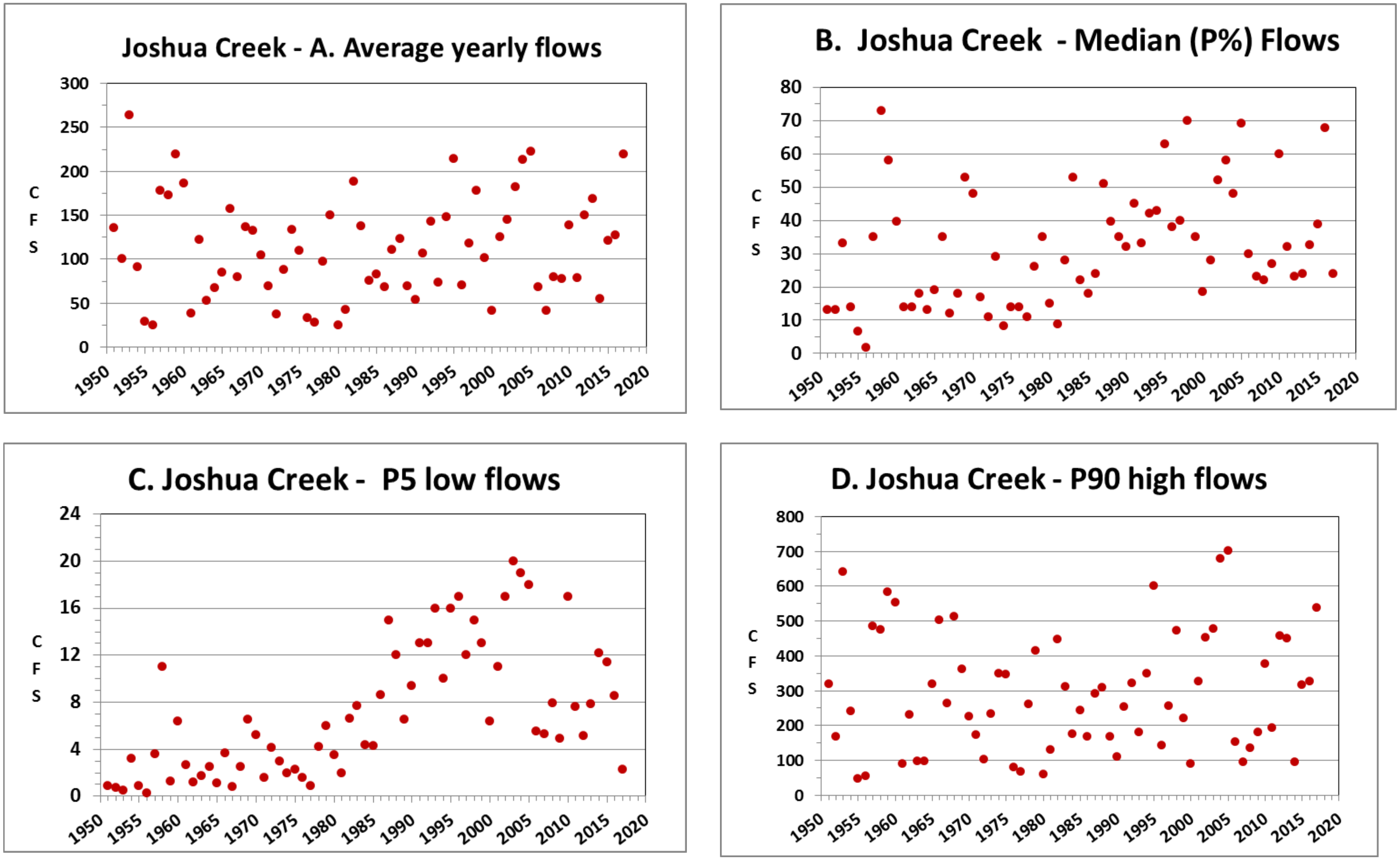


Figure 23. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Joshua Creek at Nocatee for 1951 to 2017.

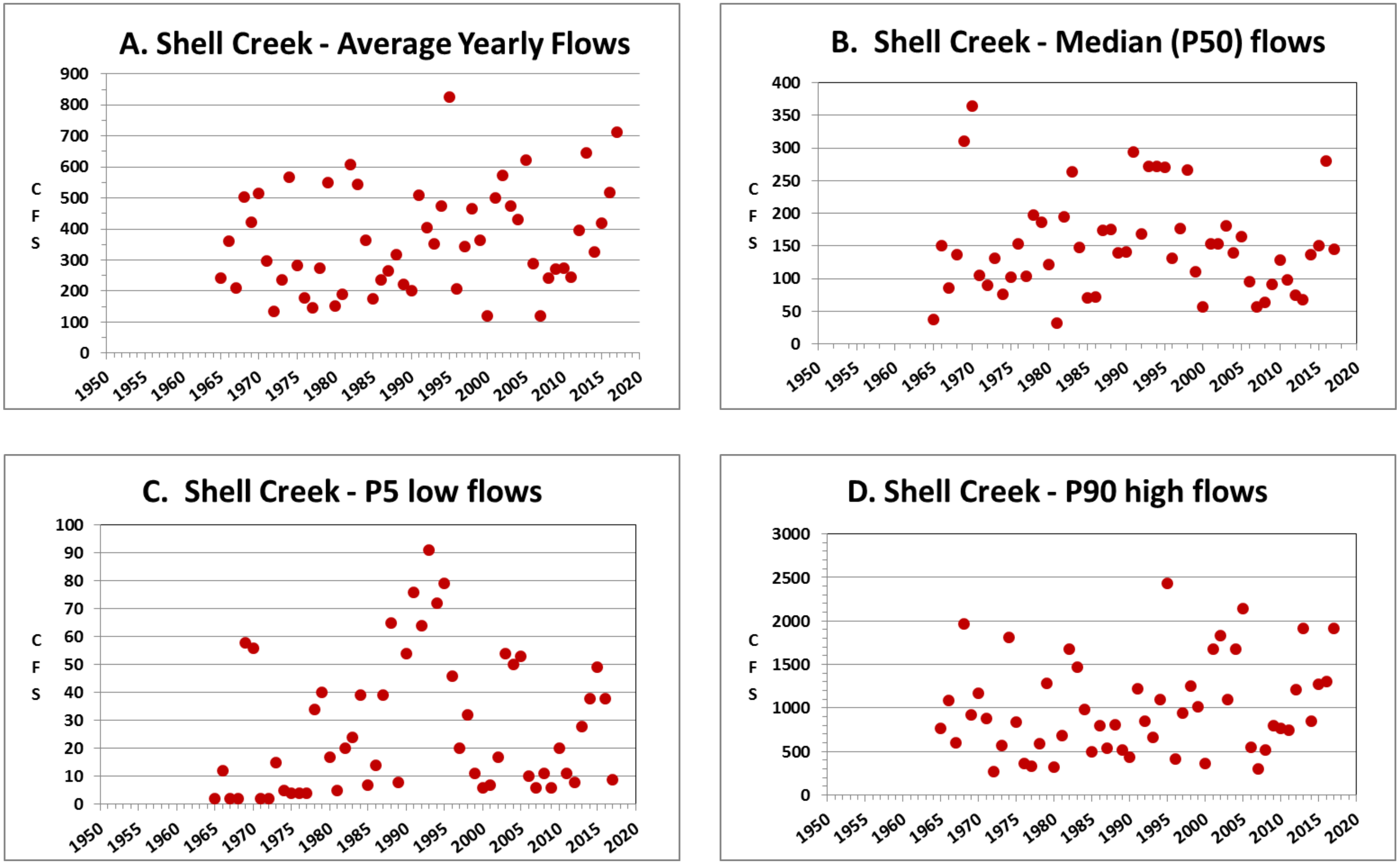


Figure 24. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Shell Creek near Punta Gorda for 1965 to 2017.

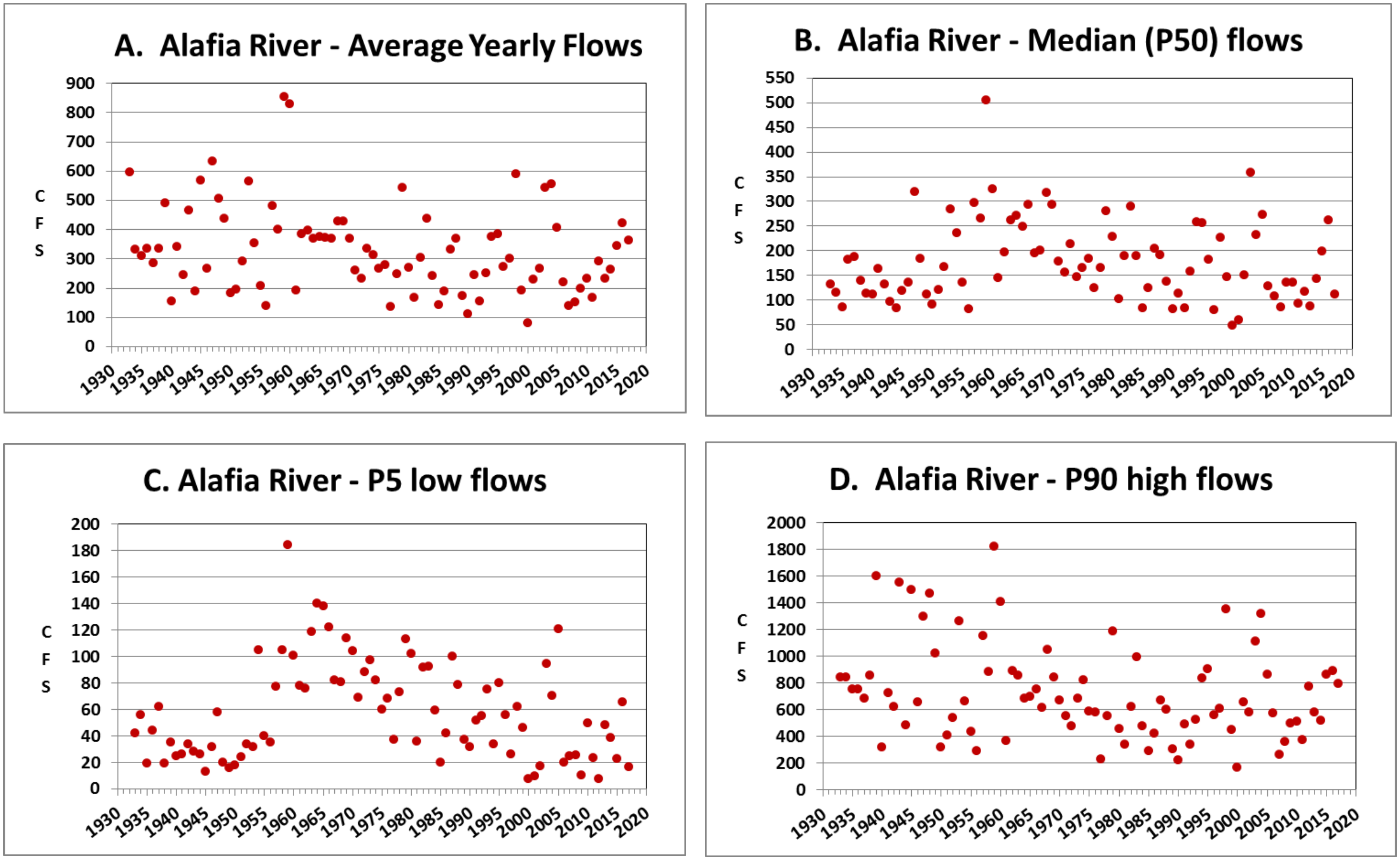


Figure 25. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Alafia River at Lithia for 1933 to 2017.

From:	Sid Flannery
To:	Yonas Ghile; Xinjian Chen
Cc:	Doug Leeper
Subject:	Fwd: DRAFT tables and figures for Flannery memo to the District
Date:	Wednesday, August 29, 2018 7:53:25 AM
Attachments:	Flannery - Peace_Alafia Memo Tables and Figures DRAFT 08-29-18.pdf

Hello Yonas and Xinjian,

See the email below I sent to some District staff today. I realized I should have copied you guys because of your work on the Lower Peace River minimum flows. I expect Doug would forward it to you pretty quickly, so I am copying him now.

Yonas - Can you send me any data you have for withdrawals by the City of Punta Gorda from the Shell Creek reservoir? I have daily values through 2011 and for the period since then I made a retrieval from WMIS. However, the WMIS values were only for monthly averages and totals - no daily values. I can use those, but daily values would be nice. Please send me what you have available, no need to do any sort of special retrieval.

Thanks,

Sid

---------- Forwarded message ---------
From: **Sid Flannery** <sidflannery22@gmail.com>
Date: Wed, Aug 29, 2018 at 7:01 AM
Subject: DRAFT tables and figures for Flannery memo to the District
To: Eric DeHaven <Eric.Dehaven@swfwmd.state.fl.us>, Leeper Doug <doug.leeper@swfwmd.state.fl.us>, Sky Notestein <Sky.Notestein@swfwmd.state.fl.us>, Jennette Seachrist <jennette.seachrist@swfwmd.state.fl.us>, <darrin.herbst@watermatters.org>, Cindy C. Rodriguez <Cindy.Rodriguez@swfwmd.state.fl.us>, Joel B. Brown <Joel.Brown@swfwmd.state.fl.us>, Basso Ron <ron.basso@swfwmd.state.fl.us>

Hello District staff,

I am preparing a technical memorandum I plan to submit to the District within the next two weeks regarding a watershed-wide approach for evaluating new surface water withdrawals from either the Peace or Alafia Rivers. In preparing this memorandum I updated rainfall and streamflow data through 2017.

Attached are the draft tables and figures to give you a bit of perspective on the memo. I may add a table or figure or two, but I think this is pretty much it for those. You will receive the draft text within two weeks.

I will first submit my memorandum to the District for review and then I will send a final to the Peace River Manasota Regional Water Supply Authority and the Polk Regional Water Cooperative for their consideration.

I would like to get it to those other two parties as soon as practical before a meeting is held about possible mediation of the water use permit challenge. When that meeting has been scheduled, would Eric and/or Cindy please let me know when the date of that meeting will be.

Thank you and have a fine day,

Sid Flannery

From:	Yonas Ghile
To:	Sid Flannery; Xinjian Chen
Cc:	Doug Leeper; Sky Notestein
Subject:	RE: DRAFT tables and figures for Flannery memo to the District
Date:	Friday, August 31, 2018 2:50:19 PM
Attachments:	City of PG withdrawals.xlsx

Sid

Thank you for sharing the technical memorandum. Attached is the City of PG withdrawals.

Have a nice long weekend!

From: Sid Flannery <sidflannery22@gmail.com>
Sent: Wednesday, August 29, 2018 7:53 AM
To: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>; Xinjian Chen <Xinjian.Chen@swfwmd.state.fl.us>
Cc: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Fwd: DRAFT tables and figures for Flannery memo to the District

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Sid

---------- Forwarded message ---------
From: **Sid Flannery** <sidflannery22@gmail.com>
Date: Wed, Aug 29, 2018 at 7:01 AM
Subject: DRAFT tables and figures for Flannery memo to the District
To: Eric DeHaven <Eric.Dehaven@swfwmd.state.fl.us>, Leeper Doug <doug.leeper@swfwmd.state.fl.us>, Sky Notestein <Sky.Notestein@swfwmd.state.fl.us>, Jennette Seachrist <jennette.seachrist@swfwmd.state.fl.us>, <darrin.herbst@watermatters.org>, Cindy C. Rodriguez <Cindy.Rodriguez@swfwmd.state.fl.us>, Joel B. Brown <Joel.Brown@swfwmd.state.fl.us>, Basso Ron <ron.basso@swfwmd.state.fl.us>

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Thank you and have a fine day,

Sid Flannery

From:	Edward Mc Donald
To:	Doug Leeper
Subject:	Re: RE: Minimum flows and Levels
Date:	Friday, August 31, 2018 6:37:44 PM

Mr. Leeper,

Thank you very much for the info. It is clear from the 2015 report that much work is left to be done and that the 2018 report will be much more comprehensive and thorough.

I think that we agree that rainfall is the main influence as to river flow at least at the higher levels. The flow of the Peace River as it reaches the southern end is often described as "braided". Is this typical for a river "delta"? Do river flowrates have a major impact on how and where these rivulets form?

I look forward to the rainfall and flowrate data that was used to draw the graphs and upon which conclusions are based.

Edward McDonald
Auburndale, FL

On Friday, August 31, 2018 02:17:28 PM EDT, Doug Leeper <Doug.Leeper@swfwmd.state.fl.us> wrote:

Mr. McDonald:

I'm pleased to inform you that the initial reevaluation of minimum flows established for the lower Peace River that you asked about in your August 27th email (see below) was completed in 2015 and is attached to this email.

Addressing your request for hydrologic data associated with the "many plots and graphs" concerning flow rates and rainfall included in the District's 2010 report on minimum flows for the Lower Peace River and Shell Creek will be somewhat more difficult than providing the attached reevaluation report. Based on the number of figures associated with hydrologic data in the 2010 minimum flows report and the retirement of all District staff that worked on development of that report, I do not think that I will be able to identify the specific files associated with the report figures. At best, I can try to identify all potentially relevant files within the archived folders of my retired colleagues that contain hydrologic data that may have been used to generate information shown in the 2010 report figures.

Please note that the compilation of these hydrologic data files would be considered a public records request and may be associated with a cost to you for District staff time associated with searching for, retrieving and distributing files to you to fulfill your request. Once staff have determined the potential cost associated with fulfilling your request, you will be informed of the cost along with an inquiry regarding whether you want the District to continue working on your request.

Thanks again for your interest in the Peace River. Let me know if you have any questions regarding the information I’ve provided in/with this email or other water management issues.

Doug Leeper

MFLs Program Lead

Southwest Florida Water Management District

Springs and Environmental Flows Section

2379 Broad Street, Brookville, FL 34604

1-800-423-1476, extension 4272 (FL only)

352-796-7211, extension 4272

doug.leeper@watermatters.org

From: Edward Mc Donald <emcdotomb@yahoo.com>
Sent: Monday, August 27, 2018 11:20 AM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Minimum flows and Levels

Mr. Leeper,

I have been reading the April 2010 final Report for the MFL for the Lower Peace River and Shell Creek. Based on that reading I have several very basic questions:

1. The report talks about a five year reassessment. Was that done and is it available?

2. There are many plots and graphs concerning flowrates and rainfall contained in this document, where can I find the raw data for flowrates and rainfall that was used to generate these plots and graphs?

Thanks for your help.

Edward McDonald

Auburndale, FL

From:	Doug Leeper
To:	FootPrintsPRR
Cc:	Shellie Ferreira-Lee; Xinjian Chen; Sky Notestein
Subject:	RE: SWFWMD Public Records Request - Edward McDonald - Minimum Flows and Levels Public Records Request...
Date:	Tuesday, September 04, 2018 7:28:00 AM
Attachments:	Email from EMcDonald-thanks look fwd to data.pdf

Shellie – Seems you may want to contact Mr. McDonald with a cost estimate (that includes my and XinJian's time) for his data request.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org

From: FootPrintsPRR
Sent: Friday, August 31, 2018 1:46 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: SWFWMD Public Records Request - Edward McDonald - Minimum Flows and Levels Public Records Request...

When replying, type your text above this line.

Notification of Issue Change
The following changes have been made to this Issue: *canRead:agentRoles, Appended a Description, Incoming mail: From: doug.leeper@swfwmd.state.fl.us; To: Shellie.Ferreira@swfwmd.state.fl.us; Cc: FootPrints.PRR@swfwmd.state.fl.us, Xinjian.Chen@swfwmd.state.fl.us, Sky.Notestein@swfwmd.state.fl.us, Added Attachment, Escalated: Notify Assignee of Incoming Email, Escalation email sent: carol.daleo@swfwmd.state.fl.us shellie.ferreira@swfwmd.state.fl.us Valerie.Jordan@swfwmd.state.fl.us peggy.meinhardt@swfwmd.state.fl.us earl.rich@swfwmd.state.fl.us, canRead:allRoles.*

Workspace:	Public Records Request
Issue:	Edward McDonald - Minimum Flows and Levels Public Records Request
Issue Number:	28248

Priority:	Medium	**Status:**	Under 7 days old
Date:	08/31/2018	**Time:**	13:46:23
Creation Date:	08/29/2018	**Creation Time:**	08:41:56
Created By:	Shellie Ferreira-Lee		

Description:
Entered on 08/31/2018 at 1:46:23 PM EDT (GMT-0400) by doug.leeper@swfwmd.state.fl.us:

Shellie:

As we discussed, I plan to send Mr. McDonald an email with the 2015 5-year assessment for the lower Peace River minimum flows that he has requested (his original email request is attached).

I'll also let him know about the likely issues involved with locating the hydrologic data associated with the 2010 lower Peace River minimum flows report that he has requested, noting that I may not be able to identify the specific data sets he has requested and will instead send all historical files that I can find from former staff files. I'll also note that this latter information will be considered a public records request and may incur a cost for staff time to search for, compile and provide the files. I'll let him know that he will be receiving an email from you that identifies the potential costs associated with the records request.

I estimate that it may take me up to 4 hours to search retired staffer folders and copy/compile files relevant to Mr. McDonald's request. Xinjian Chen likely also has hydrologic files associated with the 2010 lower Peace River report, so he will have to also provide you with a time estimate for the potential records request.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org<mailto:doug.leeper@watermatters.org>

Entered on 08/29/2018 at 8:46:37 AM EDT (GMT-0400) by Shellie Ferreira-Lee:
Shellie A. Ferreira-Lee
Southwest Florida Water Management District
Records Management Specialist
(352) 796-7211, ext. 4053
shellie.ferreira@watermatters.org

From: Earl C. Rich
Sent: Wednesday, August 29, 2018 8:24 AM
To: Shellie Ferreira-Lee <Shellie.Ferreira@swfwmd.state.fl.us>
Cc: Peggy Meinhardt <Peggy.Meinhardt@swfwmd.state.fl.us>
Subject: FW: Minimum flows and Levels

FYI...

Earl

From: Adrienne E. Vining
Sent: Tuesday, August 28, 2018 10:38 AM
To: Doug Leeper
<Doug.Leeper@swfwmd.state.fl.us<mailto:Doug.Leeper@swfwmd.state.fl.us>>
Cc: Ron Basso <Ron.Basso@swfwmd.state.fl.us<mailto:Ron.Basso@swfwmd.state.fl.us>>; Sky Notestein
<Sky.Notestein@swfwmd.state.fl.us<mailto:Sky.Notestein@swfwmd.state.fl.us>>; Brian Starford
<Brian.Starford@swfwmd.state.fl.us<mailto:Brian.Starford@swfwmd.state.fl.us>>; Earl C. Rich <Earl.Rich@swfwmd.state.fl.us<mailto:Earl.Rich@swfwmd.state.fl.us>>
Subject: RE: Minimum flows and Levels

I would respond to his second question via your first alternative. Please provide all responsive data files within the District's possession, and we can provide the clarification you noted. Please also coordinate this PRR with Shellie so it can be tracked. Thanks.

Adrienne E. Vining
Assistant General Counsel
Southwest Florida Water Management District
7601 U.S. Highway 301 North, Tampa, Florida 33637-6759
813.985.7481 x4658
1.800.836.0797 (Florida only)
813.367.9776 FAX
Adrienne.Vining@swfwmd.state.fl.us<mailto:Adrienne.Vining@swfwmd.state.fl.us>

From: Doug Leeper
Sent: Monday, August 27, 2018 3:35 PM
To: Adrienne E. Vining
<Adrienne.Vining@swfwmd.state.fl.us<mailto:Adrienne.Vining@swfwmd.state.fl.us>>
Cc: Ron Basso <Ron.Basso@swfwmd.state.fl.us<mailto:Ron.Basso@swfwmd.state.fl.us>>; Sky Notestein
<Sky.Notestein@swfwmd.state.fl.us<mailto:Sky.Notestein@swfwmd.state.fl.us>>; Brian Starford
<Brian.Starford@swfwmd.state.fl.us<mailto:Brian.Starford@swfwmd.state.fl.us>>; Earl C. Rich <Earl.Rich@swfwmd.state.fl.us<mailto:Earl.Rich@swfwmd.state.fl.us>>
Subject: RE: Minimum flows and Levels

Adrienne: I just received another email from Ed MacDonald.

The answer to his first question below is “yes.” I can provide the attached Gov Bd recap and report file (note the report file has some typos and includes a draft label) in a response to Mr. MacDonald.

I don't think I can specifically answer/address Mr. MacDonald's second question. I can review relevant Peace River/Shell Creek files/folders of Marty Kelly, Mike Heyl, Sid Flannery and Ron Basso and others, but am nearly 100% sure that I will not be able to tell which files were used for all of the rainfall and flow graphs included in the District's 2010 minimum flows report for the lower Peace River and Shell Creek.

One alternative for addressing his second question would be to indicate that we can, through fulfillment of a public records request, provide all relevant rainfall and flow data files that we can find in appropriate, archived District folders. We should, however, make it clear that we may not be able to identify which files contain data associated with specific graphs within the 2010 minimum flows report. An alternative could be that we provide a general description of the sources (likely USGS, District and NOAA or NWS databases) of the hydrologic data, and as appropriate direct him to these sources, or in the case of District data, provide them to him directly as fulfillment of a public records request.

Let me know how you want me to proceed regarding Mr. MacDonald's data/information request.

Thanks,

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)

352-796-7211, extension 4272
doug.leeper@watermatters.org<mailto:doug.leeper@watermatters.org>

From: Edward Mc Donald <emcdotomb@yahoo.com<mailto:emcdotomb@yahoo.com>>
Sent: Monday, August 27, 2018 11:20 AM
To: Doug Leeper
<Doug.Leeper@swfwmd.state.fl.us<mailto:Doug.Leeper@swfwmd.state.fl.us>>
Subject: Minimum flows and Levels

Mr. Leeper,

I have been reading the April 2010 final Report for the MFL for the Lower Peace River and Shell Creek. Based on that reading I have several very basic questions:

1. The report talks about a five year reassessment. Was that done and is it available?

2. There are many plots and graphs concerning flowrates and rainfall contained in this document, where can I find the raw data for flowrates and rainfall that was used to generate these plots and graphs?

Thanks for your help.

Edward McDonald
Auburndale, FL

Entered on 08/29/2018 at 8:41:56 AM EDT (GMT-0400) by Shellie Ferreira-Lee:
Will forward email with request.

Current Assignees: Document Services

CC(s): (this edit only) doug.leeper@swfwmd.state.fl.us

Issue Information:

Internal Request: Off

Contact Information:

Last Name: McDonald **First Name:**Edward
Email Address:emcdotomb@yahoo.com

Attachments: 2048 Email from EMcDonald-Minimum flows and Levels.pdf

From:	FootPrintsPRR
To:	Doug Leeper
Subject:	SWFWMD Public Records Request - Edward McDonald - Minimum Flows and Levels Public Records Request...
Date:	Tuesday, September 04, 2018 7:31:43 AM
Attachments:	Email from EMcDonald-thanks look fwd to data.pdf

When replying, type your text above this line.

Notification of Issue Change
The following changes have been made to this Issue: *canRead:agentRoles, Appended a Description, Incoming mail: From: doug.leeper@swfwmd.state.fl.us; To: FootPrints.PRR@swfwmd.state.fl.us; Cc: Shellie.Ferreira@swfwmd.state.fl.us, Xinjian.Chen@swfwmd.state.fl.us, Sky.Notestein@swfwmd.state.fl.us, Added Attachment, Escalated: Notify Assignee of Incoming Email, Escalation email sent: carol.daleo@swfwmd.state.fl.us shellie.ferreira@swfwmd.state.fl.us Valerie.Jordan@swfwmd.state.fl.us peggy.meinhardt@swfwmd.state.fl.us earl.rich@swfwmd.state.fl.us, canRead:allRoles.*

Workspace:	Public Records Request
Issue:	Edward McDonald - Minimum Flows and Levels Public Records Request
Issue Number:	28248

Priority:	Medium	**Status:**	Under 7 days old
Date:	09/04/2018	**Time:**	07:30:03
Creation Date:	08/29/2018	**Creation Time:**	08:41:56
Created By:	Shellie Ferreira-Lee		

Description:
Entered on 09/04/2018 at 7:30:03 AM EDT (GMT-0400) by doug.leeper@swfwmd.state.fl.us:
Shellie – Seems you may want to contact Mr. McDonald with a cost estimate (that includes my and XinJian's time) for his data request.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org<mailto:doug.leeper@watermatters.org>

Entered on 08/31/2018 at 1:46:23 PM EDT (GMT-0400) by doug.leeper@swfwmd.state.fl.us:
Shellie:

As we discussed, I plan to send Mr. McDonald an email with the 2015 5-year assessment for the lower Peace River minimum flows that he has requested (his original email request is attached).

I'll also let him know about the likely issues involved with locating the hydrologic data associated with the 2010 lower Peace River minimum flows report that he has requested, noting that I may not be able to identify the specific data sets he has requested and will instead send all historical files that I can find from former staff files. I'll also note that this latter information will be considered a public records request and may incur a cost for staff time to search for, compile and provide the files. I'll let him know that he will be receiving an email from you that identifies the potential costs associated with the records request.

I estimate that it may take me up to 4 hours to search retired staffer folders and copy/compile files relevant to Mr. McDonald's request. Xinjian Chen likely also has hydrologic files associated with the 2010 lower Peace River report, so he will have to also provide you with a time estimate for the potential records request.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org<mailto:doug.leeper@watermatters.org>

Entered on 08/29/2018 at 8:46:37 AM EDT (GMT-0400) by Shellie Ferreira-Lee:
Shellie A. Ferreira-Lee
Southwest Florida Water Management District
Records Management Specialist
(352) 796-7211, ext. 4053
shellie.ferreira@watermatters.org

From: Earl C. Rich
Sent: Wednesday, August 29, 2018 8:24 AM
To: Shellie Ferreira-Lee <Shellie.Ferreira@swfwmd.state.fl.us>
Cc: Peggy Meinhardt <Peggy.Meinhardt@swfwmd.state.fl.us>
Subject: FW: Minimum flows and Levels

FYI...

Earl

From: Adrienne E. Vining
Sent: Tuesday, August 28, 2018 10:38 AM
To: Doug Leeper
<Doug.Leeper@swfwmd.state.fl.us<mailto:Doug.Leeper@swfwmd.state.fl.us>>
Cc: Ron Basso <Ron.Basso@swfwmd.state.fl.us<mailto:Ron.Basso@swfwmd.state.fl.us>>; Sky Notestein
<Sky.Notestein@swfwmd.state.fl.us<mailto:Sky.Notestein@swfwmd.state.fl.us>>; Brian Starford
<Brian.Starford@swfwmd.state.fl.us<mailto:Brian.Starford@swfwmd.state.fl.us>>; Earl C. Rich <Earl.Rich@swfwmd.state.fl.us<mailto:Earl.Rich@swfwmd.state.fl.us>>
Subject: RE: Minimum flows and Levels

I would respond to his second question via your first alternative. Please provide all responsive data files within the District's possession, and we can provide the clarification you noted. Please also coordinate this PRR with Shellie so it can be tracked. Thanks.

Adrienne E. Vining
Assistant General Counsel
Southwest Florida Water Management District
7601 U.S. Highway 301 North, Tampa, Florida 33637-6759
813.985.7481 x4658
1.800.836.0797 (Florida only)
813.367.9776 FAX
Adrienne.Vining@swfwmd.state.fl.us<mailto:Adrienne.Vining@swfwmd.state.fl.us>

From: Doug Leeper
Sent: Monday, August 27, 2018 3:35 PM
To: Adrienne E. Vining
<Adrienne.Vining@swfwmd.state.fl.us<mailto:Adrienne.Vining@swfwmd.state.fl.us>>
Cc: Ron Basso <Ron.Basso@swfwmd.state.fl.us<mailto:Ron.Basso@swfwmd.state.fl.us>>; Sky Notestein
<Sky.Notestein@swfwmd.state.fl.us<mailto:Sky.Notestein@swfwmd.state.fl.us>>; Brian Starford
<Brian.Starford@swfwmd.state.fl.us<mailto:Brian.Starford@swfwmd.state.fl.us>>; Earl C. Rich <Earl.Rich@swfwmd.state.fl.us<mailto:Earl.Rich@swfwmd.state.fl.us>>
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MFLs Program Lead
Southwest Florida Water Management District
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doug.leeper@watermatters.org<mailto:doug.leeper@watermatters.org>

From: Edward Mc Donald <emcdotomb@yahoo.com<mailto:emcdotomb@yahoo.com>>
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Thanks for your help.

Edward McDonald
Auburndale, FL

Entered on 08/29/2018 at 8:41:56 AM EDT (GMT-0400) by Shellie Ferreira-Lee:
Will forward email with request.

Current Assignees: Document Services

CC(s): (this edit only) doug.leeper@swfwmd.state.fl.us

Issue Information:

Internal Request: Off

Contact Information:

Last Name: McDonald **First Name:**Edward
Email Address:emcdotomb@yahoo.com

Attachments: 2048 Email from EMcDonald-Minimum flows and Levels.pdf Email from EMcDonald-thanks look fwd to data.pdf

From: Shellie Ferreira-Lee
To: Doug Leeper
Subject: FW: Issue=28248 - Edward McDonald - Minimum Flows and Levels Public Records Request
Date: Wednesday, September 05, 2018 8:11:53 AM

Good morning Doug:

Please see the response from Mr. McDonald regarding his PRR.

Shellie A. Ferreira-Lee
Southwest Florida Water Management District
Records Management Specialist
(352) 796-7211, ext. 4053
shellie.ferreira@watermatters.org

From: Edward Mc Donald <emcdotomb@yahoo.com>
Sent: Tuesday, September 04, 2018 7:18 PM
To: Shellie Ferreira-Lee <Shellie.Ferreira@swfwmd.state.fl.us>
Subject: Re: Issue=28248 - Edward McDonald - Minimum Flows and Levels Public Records Request

Ms. Ferreira-Lee

I cannot afford to pay $303.26 for any public info. All that I am asking for is rainfall and flow data that supports the SWFWMD MFL determination for the Lower Peace River. Isn't this the same data that will be used to generate the 2018 report for the Lower Peace River MFL reevaluation report?

What is causing such a high administrative fee? Is there a misunderstanding as to data that I am requesting? What I was expecting from Mr. Leeper was reference to a few webpages of data that are available somewhere on the SWFWMD or related websites. The data that I am requesting should be readily available to the public and not scattered about or secreted away in someone's personal files. If it is not, there is something seriously wrong with the entire MFL procedure.

Edward McDonald
Auburndale, FL

On Tuesday, September 4, 2018 04:05:11 PM EDT, Shellie Ferreira-Lee <Shellie.Ferreira@swfwmd.state.fl.us> wrote:

Dear Mr. McDonald:

I am contacting you regarding your public records request (Issue No. 28248) for staff to compile hydrologic data files associated with the “many plots and graphs” concerning flow rates and rainfall included in the District’s 2010 report on minimum flows for the Lower Peace River and Shell Creek as described in Doug Leeper’s email to you on 8/31/2018. The total estimated cost to provide this information is $303.26 for administrative fees ($299.18), CDs ($2.50) and postage ($1.58). Payment must be received before the responsive information will be provided.

Please contact me at your earliest convenience with a commitment to pay for these records so we can arrange to fulfill your request appropriately. You may choose to pay by check or credit card. If mailed, checks must be payable to the Southwest Florida Water Management District and delivered to my attention at 2379 Broad Street, Brooksville, FL 34604. I will provide the contact information if you would like to pay by credit card.

Thank you for requesting information from the Southwest Florida Water Management District. Please do not hesitate to contact me if you have any questions.

Shellie A. Ferreira-Lee

Southwest Florida Water Management District

Records Management Specialist

(352) 796-7211, ext. 4053

shellie.ferreira@watermatters.org

From:	Doug Leeper
To:	"emcdotomb@yahoo.com"
Cc:	Shellie Ferreira-Lee; Sky Notestein; Xinjian Chen; Adrienne E. Vining; Brian Starford; Earl C. Rich; FootPrintsPRR
Subject:	Peace River data request
Date:	Thursday, September 06, 2018 1:33:00 PM
Attachments:	puntagordanw_DAL.xlsx

Mr. McDonald:

Based on your August 27, 2018 email, I identified a process and potential effort involved in responding to your specific request:

"There are many plots and graphs concerning flowrates and rainfall contained in this document, where can I find the raw data for flowrates and rainfall that was used to generate these plots and graphs?"

Based on review of the District's 2010 minimum flows report for the lower Peace River and Shell Creek, and your September 4, 2018 email to Shellie Lee, I can offer the information below. Hopefully this information adequately address your requests.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org

<><><>START SUMMARY INFORMATION<><><>

_

United States Geological Survey (USGS) Streamflow Data -- USGS National Water Information System: Web Interface

1. I reviewed the District's 2010 report on minimum flows for the lower Peace River and Shell Creek and noted that discharge data included in the report are primarily associated with four U.S. Geological Survey streamflow gaging stations. Links to daily flow data for these stations are provided below.
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    b. USGS 02297100 JOSHUA CREEK AT NOCATEE FL
       https://waterdata.usgs.gov/fl/nwis/dv/?site_no=02297100&agency_cd=USGS&referred_module=sw

c. USGS 02297310 HORSE CREEK NEAR ARCADIA FL
https://waterdata.usgs.gov/fl/nwis/dv/?site_no=02297310&agency_cd=USGS&referred_module=sw
d. USGS 02298202 SHELL CREEK NEAR PUNTA GORDA FL
https://waterdata.usgs.gov/fl/nwis/dv/?site_no=02298202&agency_cd=USGS&referred_module=sw

National Weather Service (NWS) Punta Gorda Rainfall Data – Excel File and District Water Management Information System

2. I obtained a "historic" Excel file containing rainfall data from an archived folder of the Ecologic Evaluation Section.
    a. Folder: L:\Eco Eval\Staff\Past Employees\M Kelly\%Rainfall\%Rainfall Data thru 2009
    b. File: puntagordanw.xls

3. I reviewed and modified the file (created a pivot table and chart) to compare the data within the file with information shown in Figure 2-32 in the District's 2010 minimum flows report for the lower Peace River and Shell Creek. The data seem comparable. The modified file that I created is attached.
    a. New file: puntagordanw_DAL.xlsx (*attached*).

4. NWS Punta Gorda rainfall data are available from the District's Water Management Information system. Relevant data are stored under two site identification (SID) numbers: 2711 and 25105. Links to the rainfall sites are provided below.
    a. **Punta Gorda NWS (D) Rainfall Station (in the District Water Management Information System SID 24711)**
    http://www18.swfwmd.state.fl.us/ResData/Search/ExtDefault.aspx?_ga=2.118321033.1882752891.1536252237-448330098.1505845605
    b. **Punta Gorda 4 ESE NWS Rainfall Station (in the District Water Management Information System SID 25105)**
    http://www18.swfwmd.state.fl.us/ResData/Search/ExtDefault.aspx?_ga=2.118321033.1882752891.1536252237-448330098.1505845605

<><><>END SUMMARY INFORMATION<><><>

From:	Edward Mc Donald
To:	Doug Leeper
Subject:	Re: Peace River data request
Date:	Thursday, September 06, 2018 3:18:33 PM

Mr. Leeper,

Thank you for your efforts to respond to my requests. I have not had time to look at the data that you have sent to me in this email, but only looking at the titles it sounds like the data I am looking for. I might have been able to find some of this information on my own, but that could result in me drawing the wrong conclusions simply because I used a different data set.

As a mechanical engineer and someone that is used to looking at data and drawing conclusions, it is important that everyone uses the same data or at a minimum we need to understand the limitations of the data. I recognize the fact that the Florida State laws that require a minimum flow analysis are quite vague, but their main purpose is not. That purpose is to protect the environment.

To me, water management districts are all about protection. We protect existing users of water. We protect man's interests. We protect the environment. We shouldn't need laws to accomplish these things. We should do them because they are the right thing to do. How do you balance these protections when they sometimes conflict? Is it simply an economic evaluation? (That argument assumes that everything can be given an economic score that can be compared.) Can laws be written to determine this balance? Is this balance set by public opinion? Do water management districts have a role in establishing this balance? What role does the past play in decisions that we make today? Is there an obligation to correct mistakes made in the past, even when those past mistakes were once viewed as acceptable and maybe even incentivized?

Does Doug Leeper and his group have any role in answering these questions and so many similar questions?

Thanks again,

Edward McDonald
Auburndale, FL

On Thursday, September 6, 2018 01:34:13 PM EDT, Doug Leeper <Doug.Leeper@swfwmd.state.fl.us> wrote:

Mr. McDonald:

Based on your August 27, 2018 email, I identified a process and potential effort involved in responding to your specific request:

“There are many plots and graphs concerning flowrates and rainfall contained in this document, where can I find the raw data for flowrates and rainfall that was used to generate these plots and graphs?”

Based on review of the District’s 2010 minimum flows report for the lower Peace River and Shell Creek, and your September 4, 2018 email to Shellie Lee, I can offer the information below. Hopefully this information adequately address your requests.

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Southwest Florida Water Management District

Springs and Environmental Flows Section

2379 Broad Street, Brookville, FL 34604

1-800-423-1476, extension 4272 (FL only)

352-796-7211, extension 4272

doug.leeper@watermatters.org

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<><><>END SUMMARY INFORMATION<><><>

From:	Doug Leeper
To:	Shellie Ferreira-Lee
Cc:	Sky Notestein; Adrienne E. Vining; Brian Starford; Earl C. Rich; FootPrintsPRR
Subject:	FW: Peace River data request
Date:	Friday, September 07, 2018 9:17:00 AM

From: Edward Mc Donald <emcdotomb@yahoo.com>
Sent: Thursday, September 06, 2018 3:09 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Re: Peace River data request

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    b. File: puntagordanw.xls

3. I reviewed and modified the file (created a pivot table and chart) to compare the data within the file with information shown in Figure 2-32 in the District’s 2010 minimum flows report for the lower Peace River and Shell Creek. The data seem comparable. The modified file that I created is attached.

    a. New file: puntagordanw_DAL.xlsx (*attached*).

4. NWS Punta Gorda rainfall data are available from the District’s Water Management Information system. Relevant data are stored under two site identification (SID) numbers: 2711 and 25105. Links to the rainfall sites are provided below.

    a. **Punta Gorda NWS (D) Rainfall Station (in the District Water Management Information System SID 24711)** http://www18.swfwmd.state.fl.us/ResData/Search/ExtDefault.aspx?_ga=2.118321033.1882752891.1536252237-448330098.1505845605

b. **Punta Gorda 4 ESE NWS Rainfall Station (in the District Water Management Information System SID 25105)**

http://www18.swfwmd.state.fl.us/ResData/Search/ExtDefault.aspx?_ga=2.118321033.1882752891.1536252237-448330098.1505845605

<><><>END SUMMARY INFORMATION<><><>

From:	Edward Mc Donald
To:	Doug Leeper
Subject:	Minimum Flows and Levels
Date:	Saturday, September 22, 2018 1:11:31 PM

Mr. Leeper,

You know that I am interested in determining how MFL's are determined. As I have indicated in previous emails, their main purpose is to protect the environment. I am using the MFL determination for the Lower Peace River as a test case mainly due to its significance as a potential water supply for Polk County. My first concern is the accuracy of data. To that end, I contacted the USGS and was told that the flowrate data for the Peace River at Arcadia is plus or minis 10 to 15 percent. I don't know if this error is random (i.e. varies 10-15 both high and low equally across the measuring range) or whether it is biased where it always reads high or low. I don't know the nature of this inaccuracy.

I am aware that ecological conditions of the river are monitored for "impacts", but what does that mean? The river has been "impacted" for decades so there is no baseline for comparison.

I want to make sure that we are very conservative in our approach. Past experience shows that it is very difficult (and in some cases impossible) to correct problems once we admit that an action has gone wrong.

Edward McDonald
Auburndale, FL

From:	Doug Leeper
To:	"Edward Mc Donald"
Bcc:	Adrienne E. Vining; Chris A. Tumminia; Eric DeHaven; Sky Notestein; Yonas Ghile
Subject:	RE: Minimum Flows and Levels
Date:	Wednesday, September 26, 2018 9:40:00 AM

Mr. McDonald:

Thanks for your email from this past weekend and your continued interest in the Peace River. Various physical, chemical and biological factors have been or are currently monitored in the Peace River/Charlotte Harbor system in association with the District's Water Use Permitting and Minimum Flows and Levels programs. Some goals for these monitoring efforts include the identification of expected ranges of variability in the factors, identification of relationships between the factors and flow from the watershed, and compliance with water use permit requirements.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org

From: Edward Mc Donald <emcdotomb@yahoo.com>
Sent: Saturday, September 22, 2018 1:09 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Minimum Flows and Levels

Mr. Leeper,

You know that I am interested in determining how MFL's are determined. As I have indicated in previous emails, their main purpose is to protect the environment. I am using the MFL determination for the Lower Peace River as a test case mainly due to its significance as a potential water supply for Polk County. My first concern is the accuracy of data. To that end, I contacted the USGS and was told that the flowrate data for the Peace River at Arcadia is plus or minis 10 to 15 percent. I don't know if this error is random (i.e. varies 10-15 both high and low equally across the measuring range) or whether it is biased where it always reads high or low. I don't know the nature of this inaccuracy.

I am aware that ecological conditions of the river are monitored for "impacts", but what does that mean? The river has been "impacted" for decades so there is no baseline for comparison.

I want to make sure that we are very conservative in our approach. Past experience shows that it is very difficult (and in some cases impossible) to correct problems once we admit that an action has gone wrong.

Edward McDonald
Auburndale, FL

From:	Sid Flannery
To:	Brian J. Armstrong
Cc:	Eric DeHaven; Jennette Seachrist; Karen West; Sky Notestein; Doug Leeper; Darrin Herbst; Randy Smith; Janie Hagberg; Cindy C. Rodriguez; Joel B. Brown; Ted Gates; Ron Basso; Xinjian Chen; Yonas Ghile; Luke LeMond
Subject:	Watershed based assessment of new surface water withdrawal sites - Peace and Alafia Rivers
Date:	Tuesday, September 25, 2018 5:42:33 AM
Attachments:	Watershed Based Assessment of New Withdrawal Sites DRAFT 09 24 18.pdf Figures - Watershed Based Assessment of New Withdrawal Sites DRAFT 09 24 18.pdf

Hello Mr. Armstrong and District staff,

Attached is a the draft of a report I recently prepared titled A Watershed Based Approach for Assessing Potential New Surface Water Withdrawal Sites from the Peace and Alafia Rivers.   The figures are included after the text in the attached report, plus the figures are provided in another attached file so they can be viewed separately.

In this report I present hydrographs, statistical summaries, and trend analyses of streamflow data through 2017. The status of flows in different sub-basins in the Peace and Alafia River watersheds is summarized along with factors that have affected those flows. The three page summary at the beginning of the report presents the management conclusions that are based on the technical analyses.

Early next week, I would like to send this report to the Peace River Manasota Regional Water Supply Authority, Tampa Bay Water, and the Polk Regional Water Cooperative. If the District would like to review this draft report, I will be willing to consider any comments you have. I apologize for the late notice, but If you could get any review comments to me this week I would appreciate it.

Sid Flannery

A Watershed Based Approach for Assessing Potential New Surface Water Withdrawal Sites from the Peace and Alafia Rivers

Prepared by: **Sid Flannery, Retired Chief Environmental Scientist, Springs and Environmental Flows Section, Southwest Florida Water Management District**

Dedication *- This report is dedicated to the life and work of Ellis Lanquist (1924 – 2006). As a young World War II veteran, Mr. Lanquist studied freshwater biology at the University of Florida. His 1953 Master's Thesis, A Biological Survey of the Peace River, Florida, and contributions to the subsequent reports by the Florida State Board of Health are important documents that describe the ecology of the Peace River and impacts to the river to that point in time (Lanquist, 1953; FSBH, 1955B; 1955C). Mr. Lanquist later served for many years as an admired and highly regarded teacher, coach, and administrator at Bolles High School in Jacksonville, Florida.*

Summary

This report discusses how the hydrologic and ecological characteristics of the Peace and Alafia Rivers are related to obtaining new water supplies from these rivers without causing adverse environmental impacts. A watershed-wide approach is used to identify reaches on each river where water supply availability can be maximized while minimizing the potential for environmental harm. These concepts are also briefly discussed with general application to other rivers in the region.

With regard to flow reductions, the Upper Peace River is one of the most impacted river reaches in Florida with the primary human causes being groundwater drawdowns, cessation or reduction of point sources discharges, and physical alterations of its drainage basin including extensive phosphate mining in close proximity to the river channel, much of which occurred when the regulations for mining were non-existent or not as rigorous as today. The river is currently not meeting minimum low flow rules established by the Southwest Florida Water Management District (SWFWMD) at the Bartow, Ft. Meade, and Zolfo Springs streamflow gages.

The river gains considerable flow and is less impacted farther downstream due to flow contributions from Payne, Charlie, Horse, Joshua and Shell Creeks. The physical and hydrogeologic characteristics of the river basin and the morphology of the river channel and its floodplain change downstream as well. In general, the ability to achieve new water supplies from the Peace River without causing adverse environmental impacts greatly increases progressively downstream.

With the possible exception of the diversion of extremely high flows that cause flooding problems in uplands, this report concludes there should be no new withdrawals from the Peace River or its tributaries above the confluence with Payne Creek. Withdrawals during high flows between Payne Creek and Zolfo Springs could be feasible for purposes of flow restoration of the Upper Peace River.

New withdrawals from the Peace River during high flows for potable or industrial supply should only be considered farther downstream, at least to below Charlie Creek, in order to maximize the amount of water supplies that can be obtained without causing adverse environmental impacts. Any withdrawals from the river above Arcadia would have to comply with minimum flows for the Middle Peace River, which are more restrictive than the adopted minimum flows for the Lower Peace River farther downstream.

The optimal location for obtaining additional water supplies from the Peace River is at or near the location of the Peace River Manasota Regional Water Supply (PRMRWSA) facility, located 19 miles upstream of the mouth of the river. Withdrawals at this location, which is in the tidal portion of the river, are in compliance with the adopted minimum flows for the Lower Peace River. Importantly, withdrawals at this location do not affect the upstream freshwater reaches where there have been previous impacts to the river's flow regime.

The SWFWMD is proposing to reevaluate and possibly adopt revised minimum flows for the Lower Peace River in the year 2020. The existing legal use by the PRMRWSA should have first priority and might require all the allowable flow reductions at low and medium flows to meet their water supply demands. However, on days when the PRMRWSA does not withdraw all their percentage allotment of low and medium flows, withdrawals of the remaining water could be coordinated and implemented for other users on a daily basis. In addition, pending the reevaluation of minimum flows for the Lower Peace River, there may be additional water available for other users during times of high flow.

Shell Creek is the largest tributary to the Peace River and could be a significant source of new water supplies in the region. Minimum flows for the lower segment of Shell Creek are also proposed for adoption in 2020. Once these minimum flows are adopted, existing permitted withdrawals by the City of Punta Gorda may comprise most or all the allowable flow reductions at low to medium flows. However, there may be considerable water quantities available from Shell Creek for supply at high flows. If it is determined to be necessary for regional water supply needs, consideration could be given to building an interconnection between the Shell Creek reservoir and the location of the PRMRWSA facility in order to transmit raw river from Shell Creek for transport and use at other locations.

Since there is much more water available for supply in the lower reaches of the Peace River and Shell Creek compared to the upper and middle river, consideration could be given to constructing a pipeline from the lower river to upstream locations if it is necessary to meet regional water supply needs. If new water supplies from the Peace River are truly needed, the expenditure of public funds to transport water from more ecologically resilient downstream locations to upstream water users would be well justified to make such water supplies available without causing further environmental harm to the Peace River.

Flows in the Alafia River are not nearly as impacted as flows the Upper Peace River and existing withdrawals from the Alafia River by Tampa Bay Water (TBW) are currently below the applicable minimum flow rule for the Lower Alafia River. Similar to the PRMRWSA facility on the Peace River, the location of the TBW intake on Alafia River is optimally located to maximize water supply availability while minimizing the potential for environmental impacts. Any additional withdrawals for water supplies from the Alafia River should at or near this location, not from the north or south prongs of the river, which are much smaller streams with less water supply yields and greater sensitivity to ecological harm.

These findings and conclusions for the Peace and Alafia Rivers have broader application to other rivers in the region. In general, new withdrawal sites on rivers should be located as far downstream as practical to just above the tidal reach. The ecological health of both rivers and their receiving downstream estuaries are dependent on a largely natural flow regime that reflects the climate and watershed characteristics of each river. Accordingly, using a progressive percent-of-flow approach, the SWFWMD technically evaluates and adopts minimum flow rules separately for the freshwater and tidal estuarine reaches of each river. Because they are based on ecosystems with different physical and ecological characteristics, the allowable flow reduction percentages contained in minimum flow rules for freshwater rivers are typically more restrictive than for their receiving downstream estuaries. The different minimum flow percentages for the freshwater and estuarine reaches of the Peace and Alafia Rivers are examples of this.

With the exception of the Withlacoochee River, rivers in the region are very short with limited distances on each river channel where freshwater supplies can be obtained. Given the small size of the these rivers, the hydrologic condition that there is generally greater river flow farther downstream and the switch from freshwater to estuarine ecosystems, it makes sense to locate new withdrawals sites as far downstream as practical on each river to near its tidal reach. With this strategy, flows are preserved in upstream freshwater reaches were the natural systems are more sensitive to adverse impacts due to flow reductions.

Given the ecological, aesthetic and economic importance of Florida's rivers, the expenditure of funds to transport water from downstream river reaches that are more hydrologically and ecologically resilient to upstream water users is money well spent. Factors related to the effects of sea level rise are discussed and strategies suggested if sea level rise threatens the use of a river intake for water supply.

Introduction

This report discusses the hydrologic and ecological characteristics of the Peace and Alafia rivers and how these factors are related to obtaining new water supplies from these rivers without causing adverse environmental impacts. The Peace and Alafia Rivers are two of the five principal rivers that drain the southern part of the Southwest Florida Water Management District (SWFWMD). With a total length of 106 miles on the main river channel, the Peace is the larger of the two rivers as it flows through four counties with a total watershed area of 2,350 square miles (mi^2). With a watershed area of 422 mi^2 the Alafia River has headwater reaches in western Polk County, but it flows primarily through Hillsborough County to Tampa Bay. The total channel length of the Alafia River including its longest headwater tributary is approximately 50 miles.

Both rivers are currently used for potable water supplies by regional utilities. The Peace River Manasota Regional Water Supply Authority (PRMRWSA) has an intake located approximately 19 miles upstream from the mouth of the Peace River at Charlotte Harbor. Tampa Bay Water (TBW) has an intake on the Alafia River located approximately 12 miles upstream of the mouth of the river at Tampa Bay. The intakes for both of these water supply facilities are located as far downstream as practical, just above the estuarine reach on each river where brackish waters would prohibit freshwater withdrawals much of the time. They are in optimal locations to maximize water supply availability while minimizing the potential for environmental impacts.

The SWFWMD recently received three water use permit applications from the Polk Regional Water Cooperative (PRWC) for new surface water withdrawals from (1) the Upper Peace River, (2) the Peace Creek Canal (a tributary to the Upper Peace River), and (3) from the North and South Prongs of the Alafia River. There is a need for new water supplies in Polk County within the resource planning horizon and it is my understanding the PRWC has concerns that the recent renewal of the water user permit issued for the PRMRWSA facility located near the river mouth might tie up all the available water from the Peace River. Apparently there is a pending legal challenge to the renewal of the PRMRWSA permit because of those concerns. During my nearly 30 years of employment at SWFWMD I did extensive technical work on minimum flows and water supply issues both the Peace and Alafia Rivers, but I did not communicate with either the PRMRWSA, the PRWC, or TBW regarding these recent issues for the Peace or Alafia Rivers prior to the preparation of this technical report.

In both cases, I suggest that a watershed-wide approach be used to assess water supply availability and environmental protection. Hopefully, this approach can be used to prioritize suitable locations for withdrawals or diversions from each river, either for water supply or environmental restoration and evaluate any facilities needed for water storage and distribution.

Overview of report format

The Peace River is discussed first and in greater detail as it is the larger of the two rivers and has experienced the most pronounced human impacts to its flows. It is emphasized this report only provides a brief overview of the hydrologic and ecological characteristics of each river at it relates to implementing any new surface water withdrawals. A large number of extensive and informative reports have been published about the Peace and Alafia Rivers and some pertinent findings from those reports are briefly summarized in the following pages. Readers are encouraged to consult the original reports for more detailed discussions of the hydrologic and ecological characteristics of these rivers.

In addition to several other publications, there are five reports that are particularly informative for evaluating the hydrology of the Upper Peace River basin that are referenced in this report. Those reports in chronological order are:

Lewelling, B.R., A.B. Tihansky and J.L. Kindinger. 1998. Assessment of Hydraulic Connection Between Ground Water and the Peace River, West-Central Florida. United States Geological Survey Water-Resources Investigations Report 97-4211. Tallahassee FL.

Southwest Florida Water Management District. 2002. Upper Peace River - An Analysis of Minimum Flows and Levels. Report of the Southwest Florida Water Management District, Brooksville, Florida.

Basso, R. 2003. Predicted Change in Hydrologic Conditions along the Upper Peace River due to a Reduction in Ground-Water Withdrawals. Hydrologic Evaluation Section. Southwest Florida Water Management District. 51 pp.

PBS&J, Inc. and other firms. 2007. Final Report of the Peace River Cumulative Impact Study. Report prepared for the Florida Department of Environmental Protection Bureau of Mine Reclamation, Tallahassee, Florida and the Southwest Florida Water Management District, Brooksville Florida.

Metz, P. A., and B.R. Lewelling. 2009. Hydrologic Conditions that Influence Streamflow Losses in a Karst Region of the Upper Peace River, Polk County Florida. United States Geological Survey Scientific Investigations Report 2009-5140. Tallahassee, FL.

All of the previous reports about the Peace and Alafia Rivers are limited to data collected up to a certain date, for example the end of the year 2000 in the SWFWMD report concerning minimum flows for the Upper Peace River (SWFWMD, 2002). In most cases the findings of those reports are still valid today, but where the findings of previous reports need qualification with regard to current hydrologic conditions I attempt to do so. Rainfall and streamflow data updated through 2017 are presented in the following pages, but I felt it was beyond the scope of this report to do an update of recent groundwater levels in the region. The findings of this report can be assessed by others in relation to how recent groundwater conditions in the basins of either the Peace or Alafia Rivers might affect the hydrology of these rivers and their potential to serve as sources of water supply.

The tables presented in this report are embedded in the text, while the figures are presented at the end of the report and also as a separate pdf file. Readers are encouraged either print the text and figures separately or view them simultaneously on a split screen. One solution is to print the text and simultaneously view the color figures on a screen while reviewing the report.

Long-term flow statistics for the Peace River and its major tributaries

The first objective of my analysis was to update streamflow data for the gages operated by the U.S. Geological Survey (USGS) on the main stem of the Peace River and its major tributaries. The location of the gages discussed in the report are shown in Figure 1. A list of other streamflow gages on the Peace River and its tributaries is included in Appendix A, with only the most downstream gage listed if more than one site exists on a specific tributary.

Flow statistics for the gages shown in Figure 1 were calculated beginning with the first year of complete daily records and extending through the end of 2017. There are four long-term gages on the main stem of the Peace River at Bartow, Ft. Meade, Zolfo Springs and Arcadia. The lengths of flow records for complete years are between 78 and 86 years for three of the gages; beginning in 1932 at Arcadia, 1934 at Zolfo Springs, and 1940 at Bartow. The flow records are shorter at Ft. Meade with the first complete year being 1975. Hydrographs of yearly flows at for the periods of record at these gages are presented and discussed in this report.

In order to compare flow rates over a consistent time period, Table 1 lists mean (average) flows calculated for the 43 years of record since 1975 when flow records for complete years began at Ft. Meade. This allows for a comparison of flows at both of the two gages in the upper river (Bartow and Ft. Meade) to flows at the two river gages located farther downstream (Zolfo Springs and Arcadia). Table 1 also lists the drainage area, the mean area-based runoff for the drainage basin above each gage, and the gage location relative to the origin of the river where Saddle Creek and the Peace Creek Canal meet to form the Peace River near Bartow.

It is obvious from Table 1 there is considerable gain in water as the river flows downstream. The average gaged flow near mouth of the river at the confluence with Shell Creek (1,547 cfs) is greater than the mean flow at Ft. Meade (195 cfs) by a nearly a factor of eight. Also apparent is the gain in flow between the Ft. Meade and Zolfo Springs gages, where the mean flow increases by a factor of 2.5 while drainage basin are increases by a factor of 1.7.

Table 1. Drainage areas, gage locations and average values for flow and area-based runoff for four long-term streamflow gages on the main stem of the Peace River for 1975 to 2017.				
	Drainage area and location of gage		Average Flow and Runoff	
USGS gage	Drainage area (mi^2)	Distance from the river origin (miles)	Mean Flow (cfs)	Area Based Runoff (cfs/mi2)
Peace River nr. Bartow	390	1	177	0.45
Peace River at Ft. Meade	480	14	195	0.41
Peace River at Zolfo Springs	826	37	496	0.60
Peace River at Arcadia	1,367	70	890	0.65
Peace River at Shell Creek confluence*	2,090	97	1,547	0.74

*** Sum of draingae areas and gaged flows from the Peace River at Arcadia and Horse, Joshua, and Shell Creeks corrected for withdrawals from Shell Creek by the City of Punta Gorda**

Similarly, average rates of area-based runoff expressed as cfs per square mile (cfs/mi^2) increase downstream, with values between 0.60 and 0.74 cfs/mi^2 from Zolfo Springs to the Shell Creek confluence compared to rates of 0.45 and 0.41 cfs/mi^2 at Bartow and Ft. Meade. The hydrologic characteristics of these two upstream sub-basins are complex and will be further discussed later in this report. It is also important to note that the runoff rates listed for the more downstream gages in Table 1 include the drainage area above Ft. Meade, so the average runoff rates in the areas between the Ft. Meade and the Zoflo Springs and Arcadia gages are even higher than the average values listed for the two downstream gages. These average values for flow and areal based runoff show that for obtaining water supplies from the Peace River, there is much more water available progressively farther downstream.

It is also useful to examine flow duration characteristics as these gages. Value for minimum, maximum, and five flow percentiles at these same gages are listed in Table 2. For terminology I use the percentile value above the minimum, for example the P5 flow is a low flow that when ranked among all the daily flows is five percent of the way up from the lowest flow, while P90 is a high flow that is ranked 90 percent of the way up from the lowest flow. The P50 is the median flow.

One thing apparent in Table 2 is the marked increase in low percentile flows between the Ft. Meade and Zolfo Springs gages, as the P5 flows increase from 3 to 35 cfs, the P25 flows increase from 22 to 122 cfs, and the median flows increase from 73 to 244 cfs. It is also important to note that the P5 and P10 flows go down between the Bartow and Ft. Meade gages, for as will be discussed later in more detail, the river sometimes loses flow to the groundwater system in the first few miles below the Bartow gage. The large reduction in the maximum daily flow values between Bartow and Ft. Meade is discussed later on page 16. High flows downstream of Ft. Meade show large increases, for example the P90 flow increases from 547 cfs at Ft. Meade to 1,210 cfs at Zolfo Springs to 2,310 cfs at Arcadia. With regard to diverting high flows for water supply or environmental restoration, the percentile flows also show there is much more water available progressively farther downstream.

Table 2. Percentile values for daily flows at four long-term streamflow gages on the main stem of the Peace River for 1975 to 2017									
	Flow Percentiles (cfs)								
USGS gage	**Minimum**	**P5**	**P10**	**P25**	**P50**	**P75**	**P90**	**P95**	**Maximum**
Peace River at Bartow	0	6	9	20	51	183	468	758	4,010
Peace River at Ft. Meade	0	3	6	22	73	214	547	871	2,450
Peace River at Zolfo Springs	4	35	53	108	244	564	1,210	1,840	10,300
Peace River at Arcadia	6	56	82	154	376	981	2,310	3,540	21,700
Peace River at Shell Creek confluence*	18	93	140	269	648	1,686	4,036	6,039	37,567

*** Sum of gaged flows from Peace River at Arcadia and Horse, Joshua and Shell Creeks corrected for withdrawals by the City of Punta Gorda**

Much of the gain in flow at the downstream locations is due to inflow from the tributaries to the river below Ft. Meade. Table 3 lists the drainage areas and relative locations of five major tributaries to the Peace River, along with the mean and median values for flow and area-based runoff. Again for consistency between gages, the values are computed for the years 1975 to 2017, except for Payne Creek where daily records for complete years start in 1980.

Table 3. Drainage areas, gage locations, average values for flow and area-based runoff and median flows for five major tributaries to the Peace River for 1975 to 2017 or as noted.					
USGS gage	**Drainage area (mi^2)**	**Location relative to gages on the river**	**Mean Flow (cfs)**	**Area-Based Runoff (cfs/mi^2)**	**Median Flow (cfs)**
Payne Creek nr. Bowling Green *	121	Between Ft.Meade and Zolfo Springs	116	0.96	64
Charlie Creek nr. Garner	330	Between Zolfo Springs and Arcadia	243	0.74	53
Horse Creek nr. Arcadia	218	Downstream of Arcadia	170	0.78	40
Joshua Creek nr. Nocatee	132	Downstream of Arcadia	112	0.85	34
Shell Creek nr. Punta Gorda**	371	Downstream of Arcadia	368	0.99	141

*** for 1980 to 2017**
**** corrected for withdrawals by City of Punta Gorda**

In comparing the values in Tables 1 and 3, the values for Payne Creek in Table 3 are included in the values for the river at Zolfo Springs in Table 1, while the flows for both Payne and Charlie Creek are included for the values for and Arcadia gage since those gages are located upstream. Horse, Joshua, and Shell Creeks flow into the river below Arcadia and mean values for those tributaries can be added to the mean flow at the Arcadia gage to get a total average gaged flow value for the river of 1,547 cfs for 1975-2017. By comparison, the mean flow at Ft. Meade in the Upper Peace River (195 cfs) is only 12.6 percent of this total gaged flow, although the Ft. Meade sub-basin comprises 23 percent of the total gaged area of the Peace River watershed.

With regard to location, Payne Creek is the most upstream tributary listed in Table 3 as it flows into the river about 11 miles downstream of the Ft. Meade gage. With a mean flow of 116 cfs and a comparatively high rate of area-based runoff (0.96 cfs/mi^2) , inflows from Payne Creek are very important to the flow gains observed at the downstream Zolfo Springs gage.

Charlie Creek has the second largest tributary sub-basin in the Peace watershed and flows to the river between Zolfo Springs and Arcadia. The mean flow for Charlie Creek for the 1975-2017 (243 cfs) is equal to 27% of the mean flow at the Arcadia gage (890 cfs) for this same period. The Charlie Creek sub-basin is considered to be one of the least altered major tributary sub-basins in the Peace River watershed (SWFWMD, 2004; PBS&J and others, 2007; Lee et al., 2010).

Horse Creek flows into the Peace Rive about 14 miles below the Arcadia gage. It is also a relatively lightly altered sub-basin and has a mean area-based runoff values (0.78 cfs/mi^2), similar to that for Charlie Creek (0.74 cfs/mi2). As will be discussed later, these two creeks also have very similar long-term flow trends. Joshua Creek flows into the Peace River about six miles below the Arcadia gage. It has a relatively large average rate of area-based runoff (0.85 cfs/mi^2) and previous studies have concluded that agricultural land use and irrigation have resulted in increasing flow trends in Joshua Creek (Flannery and Barcelo, 1998; PBS&J and others, 2007; SWFWMD, 2010).

Shell Creek, which flows into the tidal estuarine reach of the Peace River, has the highest mean flow of any of the tributaries (368 cfs), equivalent to 41% of the flow at the upstream Arcadia gage. The median flow for Shell Creek is more than twice as great as for any other tributary. Shell Creek also has comparatively high rate of area-based runoff (0.99 cfs/mi^2), due in part to agricultural land use and irrigation in its drainage basin.

Collectively, these flow statistics for the gages on the Peace River and the five major tributaries show that the river gains considerable flow below Ft. Meade, as the sub-basins in the middle and lower reaches of the river have greater rates of area-based runoff. As will be further discussed, it is well documented that various human factors have contributed to declining flows in the Upper Peace River sub-basin and the hydrology and ecology of the river tends to recover from these declining flows progressively farther downstream.

Influence of long-term rainfall patterns

Hydrographs and trend analyses of flows at various gages in the Peace River watershed are presented throughout the remainder of this report. Long-term patterns in regional rainfall have clearly played a major part in the trends in streamflow that will be described. To support that discussion, a general description of long-term, inter-annual patterns of rainfall in the Peace River watershed is presented below.

Long-term rainfall values for the Peace River Watershed were obtained from the website of the Southwest Florida Water Management District (https://www.swfwmd.state.fl.us), which contains yearly data for monthly, seasonal, and annual rainfall totals that can be tabulated by county or by major USGS drainage basin. I downloaded yearly values for annual and seasonal rainfall totals for the Peace River watershed. Based on areal-based averaging of data from the various rainfall stations that have operated over the years, rainfall values for the Peace River watershed are available going back to 1915. I downloaded data from 1930 to 2017 to compare to the longest flow records analyzed in this report.

Based on these data, the average annual rainfall for the Peace River watershed is 52.2 inches. Yearly rainfall totals ranged from a minimum value of 36.6 inches in the year 2000 to a maximum value of 77.9 inches in 1947. Rainfall totals for the four-month summer wet season that runs from June through September average 31.5 inches, while the average rainfall for eight-month dry season that runs from October through May is 20.7 inches.

Yearly deviations from these yearly, wet, and dry season average values were calculated and are presented in Figure 2. There is strong inter-annual variation in yearly rainfall, although sometimes there can be two, three, or more consecutive years with above or below average rainfall (Figure 2A). A number of reports dealing with the hydrology of Peace River (Basso and Schultz, 2003; SWFWMD, 2002; PBSJ and others, 2007; Metz and Lewelling, 2009) have discussed the importance the Atlantic Multidecadal Oscillation (AMO), which is a cyclical pattern in the warming and cooling of ocean temperatures that affects rainfall patterns in North America (Gray and others, 1997; Enfield and others, 2001).

Research suggests that during periods of cooler water temperatures in the North Atlantic Ocean less rainfall occurs in the dry season in peninsular Florida, while warmer temperatures in the North Atlantic produces more summer rainfall (Basso and Schultz, 2003; Kelly, 2004, PBS&J, 2007; Metz and Lewelling, 2009). These authors have discussed a warm AMO phase that extended from 1925 or 1940 through 1969 with typically higher rainfall in peninsular Florida and a cooler phase from 1970 through 1995 or 1999 with typically less rainfall, including in the Peace River basin.

The deviations from yearly average rainfall in Figure 2A largely support these conclusions, but there are significant changes from this pattern within these cycles. For example, two very dry years occurred in 1955 and 1956 during what was predominantly a wet AMO period. Conversely, two very wet years occurred in 1982 and 1983 in what was predominantly a cool, dry AMO period.

Regardless of any possible AMO effects, this report points out some long-term patterns in rainfall for the Peace River watershed that are related to the patterns observed in the streamflow data for the river and its tributaries. The 1950s were generally wet, notably with four successive wet years from 1957 through 1960 when very high flows were observed in the Peace River.

The 1970s were basically dry, with seven years with at least three inches of below average rainfall. Rainfall deficits of 10 and 12 inches occurred in 1989 and 1990 and a severe drought occurred from 1999 to 2001 when the cumulative rainfall deficit was 30 inches with 21 inches of that deficit occurring in the year 2000. A very prolonged dry period occurred from 2006 to 2013, when there were eight successive years of below average rainfall, with the greatest yearly deficits occurring in 2006 and 2007 (12 and 15 inches, respectively).

There have been some notable wet periods with the last few decades. Rainfall surpluses of 14 and 15 inches occurred in 1982 and 1983. The two-year period of 2004-2005 was also wet, with yearly rainfall surpluses near 11 inches each year. What has been very fortunate for assessing the current status of the Peace River has been four years of average or above average rainfall for four most recent years from 2014 through 2017. The effects of these series of wet and dry years on flow in the river are apparent in the hydrographs and streamflow trends discussed in the following section.

Flow trends in the Upper Peace River

In order to assess the status of flows in the Peace River watershed and the suitability of various locations on the river for obtaining water supplies, hydrographs and trends were examined at the four long-term streamflow gages on the channel of the Peace River plus five of the tributary creeks. The following section focuses on data from the Upper Peace River in Polk County at the Bartow and Ft. Meade gages. Data from the other gages are discussed in more detail later in this report.

Hydrographs of yearly values for mean, median, P5 and P90 flows at the Peace River at Bartow gage are shown in Figure 3 for the years with complete daily records (1940 to 2017). It is visually apparent there has been a declining trend in all these flow parameters, with a shift to generally lower flow values occurring in the 1970's. Prior to 1970 there were no average yearly flows below 100 cfs, but since 1971 there have been 21 years with average flows below that amount. There are also dramatic reductions in the low (P5) and median (P50) flows, again with a shift appearing in the 1970s. However, high values for the P5 and median flows in the 1950s and 1960s may have been partly due to discharges from the phosphate industry, for although they were using large quantities of ground water, much of it was released to the river. Improved water use efficiency and water retention by the phosphate industry in more recent decades has reduced such flows to the river.

The SWFWD has adopted minimum low flows for the Upper Peace River at the Bartow, Ft. Meade, and Zolfo Springs gages (for purposes of minimum flows the SWFWMD identified the Upper Peace as extending to Zolfo Springs). The SWFWMD normally adopts minimum flows using the percent-of-flow approach which covers the entire flow regime of a river, but for the Upper Peace the SWFWMD adopted only a minimum low flow for they could not determine the relative degree that flows in the Upper Peace River had declined due to the effects of groundwater withdrawals versus physical and structural alterations to the watershed. The SWFWMD, however, acknowledges that minimum flows for medium and high flows are important and intends to develop such rules for the Upper Peace River by 2025.

The regulatory rule for minimum low flows at the Bartow, Ft. Meade and Zolfo Springs gages are listed in Appendix B. The minimum low flow for the Bartow gage is a yearly 95% exceedance flow of 17 cfs. This minimum low flow is considered to be met if it is equaled for three years in a row, with provisions for how long the minimum flow must be achieved to be considered in compliance if it goes below 17 cfs for one or more years.

The graph of yearly P5 flows in Figure 3C at the Bartow gage (which are equivalent to yearly 95% exceedance flows) shows that during the 35 years of record prior to 1975 the river met the 17 cfs minimum flow except for five years (1940, 1943-1945, and 1968). Since 1975, however, the river at Bartow has been below the minimum flow target for 32 of the 43 years. There has been a noticeable rebound in the average and high P90 flows at Bartow since 2014 due to increased rainfall. The median and P5 flow also showed recovery in 2015 and 2016, but returned to low values 2017 due to low dry season rainfall that year (Figure 2C).

Climatic trends in rainfall, with a large number of below average rainfall years in the 1970s have clearly played a factor in these declining flows, but as will be discussed later, human factors have also played a role in the flow reductions observed in the Upper Peace River. Also, as discussed below, the relative degree of the declining flow trends observed at Bartow tend to lessen at the long-term gages located farther downstream in the middle and lower reaches of the river.

The declining flows graphically shown for the Bartow gage are confirmed by trend tests on each yearly flow parameter using two techniques; the non-parametric Mann-Kendall test and a linear regression of each flow parameter as a function of year. The results of these tests are listed in Table 4 on the following page along with results from the gages at Zolfo Springs and Arcadia where flow records go back to the 1930s. For consistency in the comparison of results between gages, the period analyzed for Zolfo Springs and Arcadia were limited to the 1940 to 2017 period that is available for the Bartow gage.

The two statistical tests showed similar results in that the significant declining trends were observed at all three gages in the river, but were most pronounced at the Bartow gage. The Mann-Kendall test is a non-parametric statistical procedure that is frequently used to determine if there is a monotonic trend (doesn't switch between increasing and decreasing) in a time series of values. It generates a Tau statistic, which estimates the degree that adjacent pairs of data are, or are not, identically distributed. The farther the Tau statistic is from zero indicates the strength of either a positive or negative trend. All the Tau statistics listed in Tables 1A are negative, indicating there are trends for declining flows in the Peace River Basin. Note, however, for all the flow parameters (means, P5, P50, and P90 flows) the Tau statistics are farthest from zero at the Bartow gage, indicating the declining trends are most pronounced in the upper river.

Table 4. Results of trend tests of yearly flow statistics (means, P5, median, and P90 flows) for three long-term gages on the Peace River for the period 1940 to 2017. Results are presented for (A) the non-parametric Mann-Kendall test and (B) linear regression of each yearly flow statisitc as a function of year. P is the probability of type 1 error or that there is no trend. P values less than 0.10 are highlighted in bold.

	A. Mann-Kendall		B. Linear Regression			
Gage and yearly statistic tested for trend	**Tau**	**p**	**Slope cfs per year**	**p**	**Slope as % of mean value**	**Slope as % of median value**
Average Yearly Flows						
Bartow (1940-2017)	-0.227	**0.0032**	-2.15	**0.0083**	-1.00%	-1.19%
Zolfo Springs (1934-2017)	-0.197	**0.0108**	-4.31	**0.0113**	-0.72%	-0.81%
Arcadia (1932-2017)	-0.139	**0.0760**	-6.42	**0.0274**	-0.61%	-0.64%
Yearly P5 (Low) Flows						
Bartow (1940-2017)	-0.416	**<0.0001**	-0.57	**0.0008**	-2.05%	-3.20%
Zolfo Springs (1934-2017)	-0.397	**<0.0001**	-1.36	**<0.0001**	-1.35%	-1.55%
Arcadia (1932-2017)	-0.282	**0.0003**	-1.27	**0.0034**	-1.01%	-1.20%
Yearly P50 (Median) Flows						
Bartow (1940-2017)	-0.329	**<0.0001**	-2.02	**0.0003**	-1.64%	-2.23%
Zolfo Springs (1934-2017)	-0.247	**0.0014**	-2.97	**0.0036**	-0.88%	-0.99%
Arcadia (1932-2017)	-0.183	**0.0176**	-4.06	**0.0150**	-0.79%	-0.96%
Yearly P90 (High) Flows						
Bartow (1940-2017)	-0.167	**0.0306**	-3.46	**0.0990**	-0.64%	-0.70%
Zolfo Springs (1934-2017)	-0.134	**0.0828**	-6.85	0.1109	-0.49%	-0.58%
Arcadia (1932-2017)	-0.107	0.1674	-13.50	**0.0896**	-0.50%	-0.57%

P (p) values, which denote the certainty of a statistical test, are also listed in Table 1. P values indicate the probability of incorrectly rejecting the null hypothesis, which in this case would be no trend. A low p value therefore means there is small probability of falsely rejecting the null hypotheses, so the lower the p value the more certainty of the test. Researchers often use a p value of < 0.05 (95% certainty) for identifying a statistically significant result, but I highlighted p values less than 0.1 in Table 4 to identify evidence of trend. Similar to the results for the Tau statistics, the p values tend to be smallest for the Bartow gage indicating the declining trends are most certain there.

Linear least squares regressions were also run to predict each of the yearly flow parameters as a function of year. All slopes are negative, indicating that the flows are generally tending to go down over time. A comparison of the magnitude of the slopes between the gages in the upper, middle, and lower reaches of the river can be misleading because they are expressed in cfs per year. Thus, the same relative rate of change (e.g. 2%) would produce a greater slope farther downstream simply because there is more flow in the lower river. To correct for the differences in the quantity of flow between the gages, the slope for each linear regression was divided by the mean and median values for each yearly flow parameter (e.g., the yearly P5 flows) to estimate a relative rate of change of that parameter. Note that the slopes of the regressions expressed as percentages of the mean and median values for each of the flow parameters are greatest at the Bartow gage, again indicating the declining trends are most pronounced there.

At all three gages the relative changes for each of the flow parameters are greatest for the low flows (P5), intermediate for median flows (P50), and least for the high flows (P90). Similarly, the confidence limits of the statistical tests for both the Mann-Kendall and the linear regression are strongest (low p values) for the low flows, intermediate for the median flows, and least for the P90 flows. These results indicate the lower end of the flow regime has been most affected at these gages, with intermediate effects in the middle range of flows and less effects at high flows. As will be discussed later, this could mean that some diversions of high flows at various points downstream might be feasible as this component of the river's flow regime has been the least affected.

Although declining trends are reported and rates of change expressed, it is important to note that in actuality the rates of change at these gages has not been constant. It is clear from Figure 3 for the Bartow gage and hydrographs for other gages presented later in this report show there was a large shift in flows beginning in the 1970s. Since the 1970s, flows have been more stable. Previous, earlier reports have confirmed this by running trend tests beginning in the 1970s and found no significant declining trends for gages in the Peace River since that time (Flannery and Barcelo, 1998; Lewelling and others, 1998; SWFWMD 2002; PBSJ and others, 2007). However, hydrographs of yearly flow parameters at gages on the Peace River have exhibited low values in the series of very dry years after the year 2000, and I have not rerun trend tests beginning since the 1970s with those data included.

Hydrographs and trend tests conducted on flows in other rivers with lightly impacted watersheds (e.g., Hillsborough and Withlacoochee Rivers) have also shown a tendency for declining flows over time periods extending back to the 1930s and 1940s, but no apparent trends since the 1970s. Long-term patterns in rainfall including the influence of the Atlantic Multidecadal Oscillation have clearly played a major role in the observed flow trends for the Peace and other rivers as there was generally more rainfall in the earlier decades.

However, it should not be interpreted that all is well and there are no continued human impacts to flows in the Peace River. When compared to other rivers in the region, the declining flow trends are most pronounced for the Upper Peace River. Also, as described in the next sections of this report, data from recent years clearly show that flows in the upper river have been reduced by hydrologic and physical changes in the upper river sub-basin. To some extent, these human effects on changes on flows in the upper river are manifested father downstream, but become progressively diminished as the river receives flow from less impacted downstream tributaries.

Comparison of flows at the Bartow and Ft. Meade gages, including periodic flow losses

The hydrologic characteristics of the Upper Peace River sub-basin have been the site of intensive study over the last several decades. A topic that has received considerable attention is the periodic occurrence of flow losses between the Bartow and Ft. Meade gages. Time series plots of the same yearly flow parameters shown for Bartow are shown for Ft. Meade in Figure 4. Complete daily flow records for the Ft. Meade gage begin in 1975, so the available data for this gage do not extend to the pre-1970 period when flows tended to be higher in the Peace River. Not surprisingly, the hydrographs for Ft. Meade show no apparent trends, which were confirmed by statistical tests for this period which showed no significant trends.

Rather than having trends over time, the unusual characteristic at the Ft. Meade gage is that the daily flows there are frequently less than the same-day flows at Bartow gage, which is located 13 miles upstream. Graphs of the differences in same-day flows between the Bartow and Ft. Meade gages are shown in Figures 5 A&B. The Bartow flows are subtracted from the Ft. Meade flows, so if the difference is negative that means the flow that day at the Bartow gage was greater. Graphs are shown for the entire period record at the Ft. Meade gage (1975-2017) and for three years from 2014 to 2016 for better visual resolution of the daily patterns.

It is clear from these graphs that daily flows at Ft. Meade are frequently less than at the Bartow gage. For the sake of discussion, the days when there is less flow at Ft. Meade are called flow deficits. On some days this can be a natural phenomenon, as short-term deficits may represent the time lag for an upstream flow pulse to reach the Ft. Meade gage. Flow deficits could result from the storage of water in depressions and floodplain wetlands or evapotranspiration loss between the two gages. Deficits could also be due to errors in the gaged flow estimates at either site, particularly at high flows when the river is out of channel.

Given the possibility of these periodic natural causes, it is notable that deficit flows are very frequent between these two gages and on many days involves large flow quantities. Over the period of record since 1975, daily flows at Ft. Meade were less than the flows at Bartow for 34.7 percent of the time. If only the flow deficits of greater than 5 cfs are counted, 22.4% of the days have flow deficits. I also examined flow deficits if flows at Ft. Meade were compared to the preceding day flow at Bartow and the number of days of flow deficits were very similar.

Table 5 on the following page provides summary statistics for days per year when there were flow deficits of at least 5 cfs at Ft. Meade. The mean values for days with deficits can be quite large, frequently over 20 to 30 cfs with a maximum value of 442.9 cfs in 2004, which is a special case which will be discussed later. The mean deficits were also expressed as an average rate for the year, calculated by averaging the total quantities during the deficit periods by 365 days. The deficit rates on a yearly basis were smaller, but in excess of 20 cfs in some years.

Table 5. Statistics for days that flow at the Bartow gage exceeded the the flow at the Ft. Meade gage on the Peace River by at least 5 cfs (deficit). The mean deficit for the year is the average deficit between the gages if averaged over the entire year.

Year	Number of days	Mean Deficit	Greatest Daily Deficit	Smallest Daily Deficit	Mean Deficit for Year
	(cfs)				
1975	20	16.4	61	5.6	0.9
1976	22	57.5	185	6.0	3.5
1977	69	14.6	60	6.0	2.8
1978	52	49.5	146	6.0	7.1
1979	108	74.4	320	6.0	22.0
1980	110	36.1	316	6.0	10.9
1981	211	13.5	79	5.8	7.8
1982	117	66.9	420	6.0	21.4
1983	118	72.8	416	6.0	23.5
1984	150	31.6	279	6.0	13.0
1985	122	8.9	25	5.1	3.0
1986	110	31.6	192	6.0	9.5
1987	57	60.7	445	5.2	9.5
1988	34	30.9	89	5.5	2.9
1989	16	58.3	139	7.0	2.6
1990	69	20.3	129	5.0	3.8
1991	94	29.8	338	5.2	7.7
1992	48	60.6	263	6.0	8.0
1993	92	42.3	180	6.0	10.7
1994	120	34.2	178	5.1	11.3
1995	52	45.8	283	5.2	6.5
1996	76	85.1	610	6.0	17.7
1997	123	28.7	166	5.1	9.7
1998	9	11.2	20	6.0	0.3
1999	88	27.1	134	5.1	6.5
2000	135	17.2	51	5.1	6.4
2001	15	17.3	114	5.6	0.7
2002	49	36.2	370	5.1	4.9
2003	33	66.3	240	7.0	6.0
2004	74	442.9	1670	5.3	89.8
2005	34	24.3	56	6.0	2.3
2006	63	9.0	34	5.0	1.6
2007	71	8.3	16	5.1	1.6
2008	145	27.3	175	5.0	10.8
2009	91	7.5	21	5.0	1.9
2010	60	25.2	160	5.0	4.1
2011	104	37.2	527	5.0	10.6
2012	119	11.4	75	5.0	3.7
2013	45	22.2	225	5.0	2.7
2014	101	71.3	562	5.2	19.7
2015	134	79.5	455	5.1	29.2
2016	90	101.9	581	6.0	25.1
2017	75	39.4	236	5.2	8.1

Without attempting to differentiate between natural processes and human influences, differences in daily flow rates between the Bartow and Ft. Meade gages are plotted against the same-day flow at Bartow in Figure 6. As before, the difference is the Ft. Meade flow minus Bartow, so negative values mean less flow (deficit) at Ft. Meade. Graphics are provided for the entire range of flows observed during the 1975-2017 period (Fig. 6A) and flows less than 1,800 cfs at Bartow for better visual resolution (Fig. 6B).

It is clear that there are large values for both flow gains and deficits over the range of flows at Bartow. The string of large flow deficits shown for very high flows at Bartow (> 2,200 cfs) occurred during the passage of three hurricanes over the Peace River watershed in August and September 2004, with the effects continuing into October. **The flow deficits shown during this time are striking, but should be viewed with much caution as there could be errors in the gaged flow estimates at these very high flow rates when water was well outside the river channel**. However, while acknowledging that gaged flow values involve some degree of error, the graph for Bartow flows less than 1,800 cfs shows that both flow gains and deficits are common over a wide range of flows (Figure 6B). As previously discussed, over the period of record there were about one-third of the days when flows were less at the Ft. Meade gage, even though it is located 13 miles downstream of the Bartow gage and represents a 23% gain in drainage area.

Readers are reminded however that these flow deficits were somewhat compensated for on days when the Ft. Meade gage showed a gain in flow. The net average flow at Bartow for 1975 – 2017 was 168 cfs, compared to 195 cfs at Ft. Meade. This represents a 16% increase in average flow at Ft. Meade, although there is a 23% increase in drainage area. There is a net gain in flow at Ft. Meade, but it would be greater if the days with deficits were less frequent.

With regard to compliance with regulatory rules, the SWFWMD adopted a minimum low flow of 27 cfs at the Ft. Meade gage, which is to be exceeded 95% of the time each year. Similar to the minimum low flow for the Bartow gage, the SWFWMD established criteria by which the river at Ft. Meade could meet the minimum flow in subsequent years if it fell below the minimum flow for one or more years. That seems to be a moot point, for in the 43 years of complete daily records since 1975, the low minimum low flow for the Peace River has been met only in four years (1983, 2003, 2005, 2016).

As discussed later in this report, the SWFWMD did not establish minimum flows for the entire flow regime of the Upper Peace River because it could not adequately differentiate between the effects of groundwater withdrawals and structural alterations on the declining flows in the upper river. However, based on the declining flow trends at Bartow and the frequent flow deficits observed between the Bartow and Ft. Meade gages, it seems clear that the medium and high flows of the river at the Ft. Meade gage have been impacted. **For that reason, with the possible exception of extremely high flows, no withdrawals should be allowed from the Upper Peace River or its tributaries above Ft. Meade. As will be discussed later in this report, the first point downstream to allow the withdrawal of high flows should be below the confluence with Payne Creek near the town of Bowling Green.**

Effects of groundwater drawdowns on streamflow losses in the Upper Peace River

I have used the term flow deficits because some of the daily flow shortages at Ft. Meade could be naturally occurring and involve time lags in flows due to changes in water storage. However, as will be discussed in the following pages, extensive research has shown there are many days where there are losses of water from the Peace River to the underlying aquifers, caused largely by drawdowns in the Upper Floridan and intermediate aquifers due to from extensive groundwater use in the region.

As a result, during very dry periods since the 1980s the channel of the Peace River has gone dry at a number of locations between the Bartow and Ft. Meade gages, whereas in earlier decades it was a perennial stream. Photographs of some of the sites in the Upper Peace River that dried up or had small amounts of ponded water during such dry periods in recent years are shown in Figure 7.

Although the drying of the river in recent years has been obvious, the evidence for the effects of groundwater withdrawals on flows in the Peace River go back much further. Up until the middle part of the 20th century, Kissengen Spring was a major source of flow to the Upper Peace River and was used for recreational purposes for many years . A photograph of Kissengen Spring in 1894 is shown in Figure 8A. The USGS first made flow measurements from Kissengen Spring in 1898 and periodically for years afterwards. Monthly measurements between 1932 and 1936 averaged 29 cfs (Lewelling and others, 1998). However, after those measurements the discharge of the spring progressively declined and ceased flowing in 1950. A report by Peek in 1951 documented this decline and cessation of flow and attributed it to increasing groundwater use in southeastern Polk County, which was "approximately 110 million gallons per day, of which about 75 million gallons per day is used by phosphate companies" (Peek, 1951 as cited by SWFWMD, 2002).

A hydrograph of the declining flows in Kissengen Spring is shown in Figure 8B1. There were temporary periods of flow resumption in 1955 and 1959 due to high water levels in the Upper Floridan aquifer, but permanent cessation of flow occurred in April, 1960 (Lewelling and others, 1998). A photograph of the puddle at the location of the inactive Kissengen Spring is shown in Figure 8C. In addition, artesian wells at the headwaters of the Peace River near Saddle Creek ceased to flow in the 1950s (Stewart, 1966 as cited by Metz and Lewelling, 2009).

The peak of phosphate production in the Upper Peace River basin occurred in the mid-1970s when groundwater pumpage for phosphate mining was estimated to be about 270 million gallons per day (Spechler and Kroening, 2007 as cited by Metz and Lewelling, 2009). There has been some recovery of groundwater levels in the upper Floridan Aquifer near Kissengen Spring since the late 1970s when groundwater levels were at their lowest (Figure 8B2). This increase coincides with the period of time when the phosphate mining industry started water conservation practices. This rise may also be in part due to increased rainfall and improved water conservation by agriculture. Although mining in the Upper Peace River region has declined, an increase in population and agriculture expansion since the 1970s has resulted in a redistribution of some of the pumping stresses (Spechler and Kroening, 2007 as cited by Metz and Lewelling, 2009).

There has been some increase in water levels in the intermediate aquifer system near Kissengen Spring since that the late 1970s (Figure 8B3). This rise is likely the result decreased pumpage from the Upper Floridan aquifer, which in turn causes reduced leakage from the intermediate aquifer system (Knochemus, 2006). Lewelling and others (1998) report that for Kissengen Spring to flow again, a reversal of head gradients near the spring must occur and water levels in the Upper Floridan aquifer near the spring must rebound to above 83.55 feet, which is the elevation of the spring outflow control structure. Water levels briefly reached near that elevation in a nearby Upper Florida aquifer monitor well (WMIS 670300) at the end of the wet season in 2015 and 2016.

It is widely accepted that groundwater drawdowns have resulted in flow reductions in the Upper Peace River (Lewelling and others, 1998; SWFWMD; 2002, Basso 2003; PBSJ and others, 2007; Metz and Lewelling, 2009). Various reports by SWFWMD and other have mapped groundwater levels in the region. For this report I have reprinted maps from Metz and Lewelling (2009) that show estimated drawdowns of the potentiometric surface of the Upper Floridan aquifer from predevelopment conditions to recent years. Figure 9A shows drawdowns in the Southern Groundwater Basin in from estimated pre-development conditions to May 1975, while Figure 9B shows drawdowns from pre-development conditions to May 2007. Comparison of these two maps shows substantial drawdowns in the region, exceeding 50 feet in some areas, but the region of maximum drawdowns has shifted west with some reductions in drawdowns in Polk County.

Figure 10 shows drawdowns in the Upper Peace River sub-basin for May and September 2007, with May representing the end the dry season and September the end of the wet season. The map for May shows that drawdowns in excess of 50 feet occurred in the region of the Peace River between Bartow and Ft. Meade, while the September map shows the drawdowns of between 30 and 40 feet in this region. The years 2006 and 2007 were very dry, and I suspect that groundwater levels may be higher now, for as discussed on page 10 there has been average to above average rainfall for the last four years.

Although there has been some recovery in groundwater levels since the mid-1970s, groundwater drawdowns continue to impact the flow in the Upper Peace River. Whereas the potentiometric surface of the Upper Floridan Aquifer was previously above the elevation of the bed of the river channel, it is now below the channel which causes a tendency for the river to lose water as downward seepage to the underlying aquifers (recharge). Further downstream, the potentiometric surface is above the bed of the river and there is upward seepage to the river.

This spatial relationship is shown in Figure 11, which shows the change in the potentiometric surface from pre-development conditions to average conditions in May for 1988 to 1990 (Basso, 2003). Whereas the potentiometric surface was above the river channel in Polk County during pre-development conditions, it now is below the river channel until near the Polk – Hardee county line and near the surface of the river bed in Hardee county, albeit for dry springtime conditions. Maps are not shown for the intermediate aquifer, but lowering of the Upper Floridan aquifer acts to lower the surface of the intermediate aquifer as well.

Using a variety of methods, the USGS has done extensive studies of the hydrogeology of the region and the relationships between groundwater levels and streamflow in various reaches of the Peace River (Lewlling and others, 1998; Metz and Lewelling, 2009). Those reports should be consulted for detailed information on these topics, which I do not cover in detail here. As expected, the interactions of groundwater levels and flow in the river can change with climatic conditions, as water levels in both the river and the intermediate and Upper Floridan aquifers respond to changes in rainfall during wet and dry periods.

Some characteristics, however, are generally true for the Peace River with important implications for water supply planning and natural resource management. Lewelling and others (1998) described three distinctive hydrogeologic areas along the Peace River: (1) the Upper Peace River near Bartow where groundwater recharge occurs; (2) the middle Peace River near Bowling Green where reversals of hydraulic gradients occur; and the lower Peace River near Arcadia where groundwater discharge to the river occurs. Changes in these hydrogeologic relationships contribute to the higher rates of area-based runoff for the gages in the middle and lower reaches of the river compared to the lower river that are listed in Table 1.

A distinctive characteristic of the Upper Peace River has been the formation of sinks, crevasses, and other karst features in the channel and floodplain of the Peace River between Bartow and Homeland, which is about 5 river miles above the Ft. Meade gage. Based work conducted between 1979 and 1981, Patton (1981) and Patton and Klein (1989) identified approximately 90 actual and/or probable solution features and discussed sinkhole formation and its effect on the hydrology of the Peace River. Patton and Klein conclude that the increased sinkhole formation was due to extensive groundwater use in the region, and state “that all available data indicate that increased water table drawdown and declining potentiometric levels in the aquifers in the Upper Peace River basin have led to intensified solutional activity and increased collapse.”

They also made the important finding that the sinkholes were not only in the river channel, but occurred in the river floodplain as well. They state that these sinks and other solutional conduits act as influent channels into the Upper Floridan aquifer, and due to the number of these features they are capable of affecting flow in the Peace River during times of both low and high water levels in the river. They furthermore suggested that the greatest loss of flow from the river occurs during high water levels in the river, resulting in a reduction in the amplitude and duration of high water flow.

In more recent years, extensive studies of the effects of the sinks and other karst features on flows in the river have been conducted by the Water Resources Division of the U.S. Geological Survey, notably the studies by Lewelling and others (1998) and Metz and Lewelling (2009). These researchers used a variety of techniques to examine the interactions of these karst features with the hydrogeology surrounding the river and the river’s flow, including aquifer tests, dye studies, isotope analyses, seismic reflection, and a series of seepage runs in which flows were measured at many stations along the river during various flow conditions.

Figure 12 shows a map of the principal karst features along reaches 1 and 2 of the upper river identified by Metz and Lewelling (2009). These two reaches, which extend for about two miles starting about one mile below the Bartow gage, include some of the largest karst features in the river and is where most of the flow losses have been observed. Photographs of karst features in the channel of the Peace River in reaches 1 and 2 are shown in Figure 13. At very low flows during droughts, the entire flow of the Peace River can flow into the ground through karst features such as these.

Figure 14 shows karst features located in the floodplain of the river in this same region, including two of the largest features, Gator Sink and Dover Sink. Water flows into these sinks at higher river stages via distributary channels that extend off of the main channel of the Peace River. Two photographs are shown of Dover Sink, one during low river stages and one when the sink is inundated by river water during a period of high flows and levels. The authors point out that an extensive network of cavities exist beneath the walls of Dover Sink which can store large volumes of water. During the dry season, large unfilled cavities exist, but when the rainy season begins, river water flows into Dover Sink and fills these void spaces in the underlying aquifers. Because the conduit system near Dover Sink is very large, it can accommodate a large proportion of flow from the river at multiple river stages (Metz and Lewelling, 2009).

Both of these USGS studies performed seepage runs in which flow in the river was measured at many locations in the river over a period of just a few days, usually with no rainfall, to measure areas of flow gains and losses in the river. The study by Lewelling and others (1998) included two base-flow seepage runs over a 74 mile reach of Peace River between Bartow and Nocatee, while a third high-flow seepage run focused on the upper river between Bartow and Ft. Meade. The later study by Metz and Lewelling (2009) focused strictly on streamflow losses in the upper river between Bartow and Ft. Meade.

Figure 15 shows areas of streamflow losses and gains in reaches 1 and 2 for seven seepage runs conducted between June 2002 and March 2006 in the study by Metz and Lewelling (2009). The area of highest streamflow loss was between site 7 (located 1.8 miles below the Bartow gage) to site 11 (3.7 miles below Bartow gage). The average total seepage loss in this reach for these seven was 22.7 cfs, with a minimum value of 11.6 cfs and a maximum value of 49.9 cfs. The results of a low-flow seepage run from May 2003 were compared to a low-flow seepage run conducted during May 1996 during the study of Lewelling and others (2009) with similar results (17.3 and 17.8 cfs).

During high flow periods, large losses of water were observed in reaches 1 and 2 due to floodplain storage rather than losses to karst features. The authors state that in reach 1 water drains to a series of interconnected pit lakes by way eastern ditches along the eastern floodplain. Similarly, during higher flows river water drains to pit lakes along the western floodplain in reach 2. One of these pit lakes has the capacity to store large volumes of river backwater (Metz and Lewelling, 2009). As part of the earlier study, a high-flow seepage run conducted to measure flow losses from the river channel and floodplain during higher flows was conducted in August 1995. Total streamflow losses in a 7.2 mile reach extending from 3.7 to 10.9 miles below the Bartow gage was approximately 10 percent of river flow, or about 118 cfs, but it was noted that the magnitude of most seepage losses calculated during the high-flow run was within the range of discharge measurement error of five to eight percent (Lewelling and others, 1998).

The results from these two USGS studies are provided only as an overview of some findings regarding the Upper Peace River. However, it is emphasized the interactions of groundwater with flows in the Upper Peace River are spatially complex, involving both the intermediate and Upper Floridan aquifers. In that regard, the SWFWMD (2009) implemented a series of nested wells to examine relationships of water levels in the surficial, intermediate and Upper Florian aquifer in the vicinity of the Upper Peace River. As with other documents cited in this report, readers are encouraged to obtain the original reports for thorough discussions of the interaction of groundwater with streamflow and other related topics pertaining to the Peace River.

Other factors affecting flows in the Upper Peace River

Four of the reports that are listed on page 4 and referenced extensively in this report discuss other factors affecting flows in the Upper Peace River, with the broadest assessments provided by SWFWMD (2002) and PBS&J and others (2007). As previously discussed, long-term changes in rainfall with generally greater yearly rainfall totals in the 1950s and 1960s have been acknowledged as a major factor affecting streamflow trends in the Peace River. As also discussed, groundwater drawdowns have also been an important factor contributing to declining flows in the upper Peace River. However, there have been physical and structural alterations to the Upper Peace River sub-basin which have also likely played roles in the observed flow trends.

Phosphate mining in the drainage basin of the Upper Peace River

Figure 16 shows the distribution of major land uses within the drainage basin of the Upper Peace River for the year 2005. It is clear that phosphate mining is a major land use with much of the mining in very close proximity of the Upper Peace River, which in Figure 16 extends downstream to the Polk/Hardee County line. Using data from 1999, SWFWMD (2002) reported that 26.2% of the drainage basin above the Zolfo Springs gage, which is located approximately 10 miles south of downstream limit of Figure 16, has been mined but points out that much of the mined land is above Ft. Meade and also in the Payne Creek sub-basin.

Much of the mining in the drainage basin of the Upper Peace River was done before the state of Florida required mandatory reclamation of mines lands in 1975, while other areas were mined when the reclamation standards are not what they are today. There are extensive clay setting areas located in very close proximity to the floodplain of the Upper Peace River, which have entirely different physical properties in terms of water storage and transmission than the landscape prior to mining (Brickman and Koening, 2007 as cited by Metz and Lewelling, 2009). Also, many small natural stream channels were mined in the upper river basin.

Much more extensive descriptions of the history and distribution phosphate mining and its effects on the physical hydrography of the Upper Peace drainage basin is provided by the five reports listed on page 5, plus an earlier USGS report about hydrologic differences between mined and unmined lands (Lewelling and Wylie, 1993). Based on those findings and other work in the region, it is reasonable to say that the extensive mining along the banks and in the watershed of the Upper Peace River that was done over many earlier decades has had a significant effect on the river's hydrology.

Reduction or elimination of wastewater discharges

An important factor that could have affected the hydrographs and trends for low and medium flows in the Upper River was the reduction of elimination of wastewater discharges. The report by SWFWMD (2002) claims that beginning around 1985 a number of wastewater discharges to the upper river were either reduced or eliminated, including water used for phosphate mining and processing, discharges from associated chemical plants, and several wastewater treatment plants.

As mentioned on page 10, the phosphate industry used to pump more ground water than they do now, but much more of this water made its way to the Peace River and its tributaries. Improvements in water use efficiency and retention by the industry has reduced these flows to the river. Relatively large reductions in phosphorus and fluoride concentrations in the upper river and at the Arcadia gage indicate that a significant sources related to mining activity were reduced or eliminated around 1985 (SWFWMD, 2002).

The flow of excess water from mining activities may be partially why there were high values for low and medium flows at the Bartow gage in the 1950s and 1960s. A similar rise in low flows was observed in the Alafia River, where extensive mining also occurred during this time (SWFWMD, 2008). It is again reiterated that wet climatic conditions were also a major factor during those decades, which also would resulted in increased flows resulting from mining activity during that time.

Additional reductions in low flows in the Upper Peace River were likely partly due to the removal of point source discharges in the basin. For example, in 1987 approximately 14 to 16 cfs of wastewater from the City of Lakeland's municipal treatment plan was removed from the Stahl Canal, which flowed to upper river system via connections through Banana Lake, Lake Hancock and Saddle Creek (SWFMD, 2002). Although the effects of groundwater withdrawals resulted the Upper Peace River to lose water to the underlying aquifers in the 1950s and 1960s, low flows in the river channel were not as noticeably affected because these losses were partially offset, or masked, by an increase in wastewater discharges to the river. As these discharges were reduced or eliminated, the reductions in low flows became more apparent.

Other physical alterations of the drainage basin of the Upper Peace River

In addition to extensive phosphate mining, there have been other physical modifications of the basin of the Upper Peace River sub-basin. The reports by SWFWMD (2002) and PBS&J and others (2007) provide detailed descriptions of other changes that have occurred over time in the major sub-basins that comprise the Upper Peace River basin. The two major sub-basins that contribute flow to the Upper Peace River at the Bartow gage are the Saddle Creek sub-basin, that includes the inflows and outflows from Lake Hancock, and the Peace Creek sub-basin to the east. These two creeks join about one mile above the Bartow gage to form the Peace River.

Both the Peace Creek and Saddle Creek sub-basins are not typical stream catchments as they do not a well defined dendritic network of streams. Instead, these sub-basins are physically complex with headwater lakes, water control structures, drainage canals and some areas that are internally drained. Groundwater drawdowns have interacted with these physical characteristics to reduce flows contributions to the Upper Peace River.

Modifications to the Peace Creek drainage basin - SWFWMD (2002) describes the creation of several local drainage districts in the Peace Creek drainage basin in the early part of the 20th century and construction of canals as part of the Peace Creek Drainage Canal. These canals allowed for improved drainage and may have lowered groundwater and surface water levels in the region (SWFWMD, 2002). Additionally, Johnson (1960 as cited by SWFWMD, 2002) reported the Peace Creek drainage basin received more drainage from the Green Swamp to the north before construction of the Atlantic Coastline railroad track and U.S. Highway 17&92. Pride and others (1966) also suggested that the construction of levees, ditches, highways and railroad fills and other drainage improvements reduced the drainage from the Green Swamp area to the headwaters of Peace River basin in northern Polk County.

In my opinion, it is difficult to evaluate the net effect of the drainage modifications in the Peace Creek sub-basin, but whatever these effects have been they are reflected in the flows at the Peace River at Bartow gage, which has experienced significant flow declines over the years.

Control structures on headwater lakes - Another significant alteration of the drainage basin of the Upper Peace River include the placement of water control structures and management of water levels on many of the headwater lakes that are occur in the Peace Creek and Saddle Creek sub-basins. While the effects of these modification are uncertain and somewhat speculative, the report by SWFWMD (2002) suggests that there was a considerable loss of lake storage associated with modification of these lakes and the construction and connection with of the Peace Creek Drainage Canal System.

As described later in this report, in the Saddle Creek sub-basin the SFWWMD has pursued a large project on Lake Hancock to raise its water levels in an effort to release water to the Upper Peace River to help achieve minimum flows.

Alteration of natural stream catchments and channels - In their assessment of cumulative impacts to the Peace River and its watershed, the report by PBSJ and others (2007) includes a section on the loss of natural stream channels throughout Peace River watershed between the 1940s and 1999. They considered the loss of a natural stream channel could result from modifications such channelization, filling, grading, and otherwise altering the natural stream. They found that a total of 347 miles of natural stream channels had been lost throughout the Peace River watershed, with the largest losses resulting from mining (101.2 miles), agriculture (64.5 miles) and urban (37.5 miles) land uses.

They state that most of the losses were to smaller first and second order streams rather than to the river channel, although a portion of the Peace River below Lake Hancock has been channelized. They also point out that streams already channelized before the 1940s were not counted so the estimate of stream segments that were lost are conservative. Since the 1940s, they found that the largest of natural stream channels was in the Lower Coastal Peace sub-basin (77.5 miles), followed by sub-basins in or near the upper river including Payne Creek (66.9 miles), the Peace River at Bartow (57.8 miles) and the Peace River at Zolfo Springs (31.6 miles). Urban land uses resulted in the most natural stream loss in the Lower Coastal sub-basin, while mining resulted in the most stream loss in the sub-basins in the upper river.

The report by Metz and Lewelling (2009) also shows maps of the hydrography of the Upper Peace River basin for historical (1850-1855) and recent (1985) conditions. They also point out that many stream channels were altered by phosphate mining and agricultural activities. The state that the altered streams previously had dendritic (branched) drainage patterns and channels that are longer than their current configuration.

Relationship of physical and structural alterations to the determination of minimum flows

Minimum flows are intended to manage the effects of water withdrawals on streamflow and natural systems, as Chapter 373.042 defines minimum flows as “the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area.” However, in addition to water withdrawals, other human modifications to stream catchments can affect the flows of river and streams, so Section 373.042(1) F.S. states that when establishing minimum flows, the governing board “shall consider changes and structural alterations had had, and the constraints such changes or alterations have placed on the hydrology of the affected watershed, surface water, or aquifer, provided that nothing in this paragraph shall allow significant harm as provided by S. 373.042(1) caused by withdrawals.” In essence, the District is to evaluate and account for the effects of previous structural alterations on a watercourse when assessing the potential for withdrawals, whether from ground water or surface water, to cause significant harm to the natural systems of a stream or river.

The combined findings of studies and assessments of the Upper Peace River basin indicate the observed declines in flows in the Upper Peace River are due to a combination of changes in rainfall, groundwater withdrawals in the region, and physical and structural alterations in the upper river’s drainage basin. In their minimum flows report for the Upper Peace River, the SWFWMD (2002) concluded that while the medium and high flows in the Upper Peace River in recent decades "are not adequate to protect ecological resources across the entire flow regime, the inability to achieve those flows in a quantitative way cannot, at this time, be adequately partitioned among the various controlling factors (rainfall, structural alterations and changes, withdrawals)."

For that reason, minimum flows for medium and high flows were not adopted for the Upper Peace River at that time (2002). However, the SWFWMD suggested that the findings of the report could be used to be used to develop strategies to restore components of the rivers flow regime and natural systems by a combination of physical, regulatory, and other water management techniques. They furthermore suggest that a full range of minimum flows could be adopted, but will likely require the development of additional tools such as an integrated ground water / surface water model of the river to better differentiate between the effects of withdrawals versus other changes in the watershed.

Although minimum flows for the entire flow regime of the Upper Peace River have not been adopted at this time, it is clear that the entire flow regime of the river has been affected by human activities. The findings that support this conclusion are the significant declining trends at the Bartow gage, the documented effects of groundwater drawdowns on flow losses in the Upper Peace River, and the frequent flow deficits observed between the Bartow and Ft. Meade gages which occur over a wide range of flows. Considering these findings, it is my conclusion that with the possibility of extremely high flows, no withdrawals should be allowed from the Upper Peace River above the confluence with Payne Creek until minimum flows for medium and high flows for the upper river are adopted, as it could well be determined the entire flow regime of the upper river upstream of Payne Creek is in recovery.

Lake Hancock modifications

As mentioned on page 24, the SWFWMD has pursued a large project on Lake Hancock to improve the quantity and quality of the water flowing from the lake to the Upper Peace River via Saddle Creek. The project has two primary components. The first was to replace the water control structure at the lake in order to raise the operating levels in the lake to reflect more historic water levels. This increases the water storage in the lake, allowing more water to be released to Saddle Creek and the Upper Peace River in the dry season to help meet the adopted minimum flows for the upper river.

The Lake Hancock project also involved the construction of a 1,000 acre treatment wetland near the outlet of the lake to remove particulate matter and improve the water quality of the water leaving the lake in order to reduce the nutrient load to the Peace River and Charlotte Harbor. Both of these projects have been completed, but the full establishment of the marsh vegetation in the treatment marsh is still underway.

Flow to Saddle Creek and the upper river from the outlet structures at both Lake Hancock and the treatment marsh are gaged to measure flow. The SWFWMD accesses flow data from these sites on a real-time basis to release water to Saddle Creek in the dry season to help meet the minimum flows for the Upper Peace River. This is a promising strategy, but it may be easier to meet the minimum low flow at the Bartow gage as opposed to the Ft. Meade gage due to water losses between these two sites.

Morphological characteristics of the Upper Peace River and its floodplain - Considerations for the location of possible future withdrawals

The morphological characteristics of the Upper Peace River and the hydrological requirements of floodplain wetlands associated with the upper river also pertain to my recommendation that with the exception of some extremely high flows, no withdrawals be obtained from the Upper Peace River above the confluence with Payne Creek. Figure 17 shows a map of wetland types along the upper river above Zolfo Springs. These wetlands were identified by U.S. Fish and Wildlife's National Wetlands Inventory, with the map adapted from the minimum flows report for the upper river (SWFWMD, 2002).

The light-green color in the map denotes deciduous wetlands that are semi-permanently flooded (P_FO6_F in the key). These wetlands are widely distributed from just above Bartow to Ft. Meade, but much less abundant below there are the river becomes more incised. The blue color (P_FO6_C) denotes broad-leaved deciduous wetlands that are seasonally flooded, which are also widespread in this same reach but extend a little below Ft. Meade with isolated pockets located farther downstream.

Approximately two miles below Ft. Meade, broad leaved deciduous forests that are temporarily flooded (pink, P_FO1_A) become more abundant due to changes in the morphology of the river floodplain. Farther downstream about two miles below Bowling Green just below the confluence with Payne Creek, these wetlands then become less abundant. From there, uplands (gray, U) become more common, although there are pockets of seasonal and semi-permanent wetlands farther downstream, particularly between Wauchula and Zolfo Springs.

The minimum flows report by SWFWMD (2002) presented numerous graphs and tables that showed that the hydroperiods of these wetlands have been greatly reduced due to the flow declines that have occurred in the Upper Peace River. These hydroperiod reductions have been most acute and have probably had the most pronounced ecological impacts in the semi-permanent and seasonally flooded wetlands in the upper reaches of the study area above Bowling Green. Further withdrawals would only worsen the hydrologic conditions in these wetlands which are a critical part of the river ecosystem, supporting the conclusion there should be no withdrawals from the upper reaches of the Peace River.

Given the distribution and hydrologic requirements of these wetlands, there should be no new withdrawals for any purpose above the confluence with Payne Creek. An exception could be the infrequent diversion of extremely high flows that inundate uplands, homes or crossings in the upper reaches of the river. No withdrawals should be allowed above Payne Creek that reduce the hydroperiods of riverine wetlands upstream of that location.

Considerations for the locations of possible withdrawal points to capture high flows farther downstream are discussed in the following section, which discusses the status of flows in the middle and lower reaches of the Peace River.

Streamflow characteristics of the middle and lower Peace River and its tributaries

The spatial patterns of land and water use in the middle and lower reaches of the Peace River watershed are very different compared to the upper river. Consequently, the human effects on streamflow are different as well. In the following section, time series and trends in streamflow and are compared between the Upper Peace River with the middle and lower reaches of the river. The differences in these streamflow characteristics are briefly discussed with regard to spatial differences in the region's physiography, hydrogeology and patterns of land and water use as they pertain to determining preferable locations for obtaining water supplies while minimizing the potential for adverse environmental impacts.

Land use - Maps of the distribution of four major land use categories in the Peace River watershed are shown in Figure 18 for the 1940s, 1979, and 1999. The maps, which are adapted from the cumulative impact study of PBS&J and others (2007), show the distributions of improved pasture, intensive agriculture, urban development, and mining. That report can be viewed for detailed discussions of the changes in land use over time in the major sub-basins in the Peace River watershed.

The major drainage sub-basins in the watershed are labeled in the map for the 1940s land use. It is apparent from Figure 18 that mining has greatly increased in the sub-basins of the Upper Peace River, including the sub-basin of Payne Creek. Apparently, since 1999 there has been some additional mining including in the Horse Creek sub-basin, but I did not check any more recent land use coverage maps or data.

Urban land uses are centered in two locations. First, in the Upper Peace River basin, particularly in the area of the headwater lakes in and near the cities of Lakeland and Winter Haven. Second, in the very lower region of the watershed along the tidal reach of the river associated with the cities of Port Charlotte and Punta Gorda. In between these two areas, other smaller urban areas are associated with the towns of Bartow, Ft. Meade, Bowling Green, Wachula, Zolfo Springs and Arcadia.

Agricultural land uses are widespread in the middle and lower regions of the watershed. Of particular note is the increase in intensive agriculture (row crops and citrus) in the sub-basins of Joshua and Shell Creeks and the Peace Arcadia and Lower Peace sub-basins. These agricultural land uses have much greater water use rates than improved pasture, which is often not irrigated or at much less rates.

Hydrogeology - The hydrogeology of all or parts of the Peace River watershed is described in a number of documents (Lewelling and Wylie, 1993; Lewelling and others, 1998; SWFWMD, 2002; Basso, 2003; PBSJ and others, 2007; Metz and Lewelling, 2009). Briefly, there are three recognized aquifer systems in the region. As described by Basso (2003), at the surface and extending up to several tens of feet thick is the unconfined surficial aquifer. It is generally comprised of unconsolidated quartz sand, silt, and clayey sand. Underlying the surficial is the confined intermediate aquifer system which consists of a series of thin, interbedded limestone and phosphatic clays of generally low permeability**.** The third aquifer system, which underlies the intermediate aquifer system, is the confined Floridan aquifer system which is composed of a series of limestone and dolomite formations.

The Floridan aquifer if further divided into the Upper Floridan aquifer and the Lower Floridan aquifer, which are separated by a middle confining unit. Because of its poor, briny water quality, deeper depth and limited ability to yield water, the Lower Floridan aquifer is primarily used for disposal of industrial waste through deep well injection. Water supplies for municipal, industrial, and agricultural use are obtained from the higher quality and more productive Upper Floridan aquifer.

An important characteristic is that the surface of the Upper Floridan aquifer is closer to the land surface in the upper reaches of the Peace River watershed. The Upper Florida aquifer becomes gradually deeper in southerly and westerly directions and is more hydraulically isolated from the surficial aquifer and the streams channels in the lower reaches of the Peace River watershed due the presence of thicker confining units. This has important implications on how groundwater withdrawals interact with streamflow in different regions of the Peace River watershed.

Streamflow trends in the middle and southern reaches of the Peace River Watershed

In addition to a number of smaller streams, there are five major tributaries that flow to the Peace River south of Bowling Green; which from north to south are Payne Creek, Charlie Creek, Joshua Creek, Horse Creek, and Shell Creek (Figure 18). Flow statistics for these creeks dating from 1975 were listed in Table 3, with this time period chosen to be consistent with the period of record for the Peace River at Ft. Meade gage. It was discussed on page 6 that since 1975, the rates of area-based runoff in average cfs per square mile from these creek sub-basins are markedly greater than for the Upper Peace River sub-basins measured by the gages at Bartow and Ft. Meade.

Flow records for four of these creeks go back to before 1975, which allows for an interesting comparison of flow trends with the Peace River. The first year of complete daily records begins in 1951 for Charlie, Horse and Joshua Creeks, while the first year of complete daily records for Shell Creek is 1965 and 1980 for Payne Creek. Trends in flows at these creeks are discussed, but it is first useful to examine hydrographs for gages on the Peace River at Zolfo Springs and Arcadia for comparison.

Flows at Zolfo Springs and Arcadia - Hydrographs of yearly values for average annual flows, P5, median (P50) and P90 flows are presented for the years with complete daily records for the gages on the river at Zolfo Springs and Arcadia (Figure 19 and 20). The records are quite long, beginning in 1931 at Arcadia and 1934 at Zolfo Springs. The hydrographs for these gages appear similar to the long-term hydrographs for the Bartow gage in that generally higher values were observed in the decades prior to the 1970s. However, the declines in the flow parameters generally don't appear as pronounced as those shown for the Bartow gage (Figure 3). This is confirmed by the differences in the Tau statistics, p values, and relative slopes in the statistical trend tests that were presented in Table 4 (page 12).

There has been a dramatic drop in the low flows at Zolfo Springs as evidenced by the hydrograph of the P5 low flows (Figure 19C). The SWFWMD has adopted minimum low flow of 45 cfs at the Zolfo Springs gage, which is to be met 95% of the time each year, equivalent to the P5 flow shown in Figure 19C. In the 66 years of record prior to the year 2000, the minimum flow was met all years with the lowest P5 value of 52 cfs in the 1985 drought. However, in the 18 years since the year 2000 the minimum flow has not been 11 times, with the lowest P5 value (7 cfs) recorded in the year 2000. The years with below average rainfall that have periodically occurred since the severe drought in 2000-2001 have been a factor, but there were also some droughts in earlier decades and it appears that human factors have contributed to the decline in low flows at the Zolfo Springs gage. As discussed on page 13, there were also significant declines in the medium and high flows, but the trends were most pronounced at low flows, as this appears to be the component of the flow regime of the Peace River that has been most affected.

The time series plots of the yearly flow parameters at the Arcadia gage shows similar patterns to the Zolfo Springs, with the lowest P5 values recorded since the year 2000. The lowest values for the other parameters shown were also in the year 2000, with the exception of a nearly equal minimum value of 338 cfs for the P90 flow in 2007 when the combined rainfall deficit for that year and 2006 was 26.9 inches. The average yearly flow value in 2007 was also very close to the minimum average yearly flow in the year 2000.

It is encouraging to point out that flows at all gages in the river have increased in recent years, as there has been average or above average rainfall since 2014. Graphs of average yearly flows and other flow parameters at all gages on the river have shown increases in the last four years. An interesting variation to this is the very low P5 values in 2017, as that year started off very dry, but had above averages wet season rains (Figure 2B) which resulted in very high P90 and annual average flows. Flows have generally been generally above average during 2018 as there has been above average rainfall through the month of August.

Flows in five major tributaries - Hydrographs of the same yearly flow parameters are shown for the Payne, Charlie, Joshua, Horse, and Shell Creeks in Figures 21 through 25. For Charlie and Horse Creeks (Figures 21 and 22), where flow records go back to 1951, the declines in flows from before the 1970s to later decades are not as readily apparent as for the gages on the river. These are much smaller sub-basins compared to the river and have different hydrographic characteristics, so some natural differences in long-term flow patterns can be expected. Similarly, they have different hydrogeologic characteristics, especially compared to the upper river, which could also result in differences in the streamflow response to changes in long-term rainfall.

The sub-basins of Charlie and Horse Creeks, however, have less intensive land and water use than the sub-basin for the Upper Peace River which has likely contributed to differences in their flows over time compared to the Peace River, especially its upper reaches were human impacts to flows have been most pronounced. For a recent treatment of the hydrologic characteristics of Charlie Creek, readers should consult the report by Lee and others (2010), which evaluates of the effects of groundwater levels and headwater wetlands on flows in Charlie Creek. The flow regime of Charlie Creek probably represents the natural hydrology of lightly altered drainage basin in the Peace River watershed (SWFWMD, 2005A).

With flow records also going back to 1951, a very different pattern is seen for Joshua Creek (Figure 23). There is no apparent trend in average yearly flows, but the P5 low flows and median flows are increasing. Other articles and reports have concluded these increases in low and medium flows in Joshua Creek are the result of agricultural irrigation. Excess irrigation waters can directly reach the stream, plus irrigation can supplement the surfical aquifer which can increase baseflow and also result in greater runoff after storm events due to more saturated soil conditions (Flannery and Barcelo, 1998; PBS&J and others, 2007).

Compared to the upper reaches of the Peace River, the top of the Upper Floridan aquifer is deeper and more isolated from the surficial aquifer and surface water features in the Joshua Creek sub-basin. Groundwater withdrawals therefore do cause similar effects on streamflow losses, but pumpage of the water to the land surface for irrigation can result in increased streamflow as just described. Similar increases in low flows have also been documented in the Little Manatee and Myakka Rivers, which have similar hydrogeologic characteristics, due to the effects of extensive agricultural irrigation within their watersheds (Flannery and others, 1992; SWFWMD, 2011).

Daily flow records for complete years go back to 1980 for Payne Creek, which flows into in the upper river near Bowling Green. As discussed on page 7, flows from Payne Creek are very important to improving the flow conditions and sustaining the river below Ft. Meade. The Payne Creek sub-basin is complex, as there has been extensive mining there with reclamation in various stages of succession. In a report prepared for the Florida Institute of Phosphate Research, Schreuder Inc. (2006) concluded that for Payne Creek and a series of other streams that have had extensive mining in their drainage basins, flows have not been reduced by mining activities in part due to reduced evapotranspiration from the mined/reclaimed lands. There have been concerns expressed by others, however, that as vegetation growth and succession proceeds on reclaimed lands, evapotranspiration rates may increase.

Hydrographs for yearly flow parameters for Payne Creek are shown in Figure 24, with the horizontal axis extending back to 1950 for easier comparison to the hydrographs for the three creeks with longer record. All parameter fluctuate show expected variations between wet and dry years since 1980. Similar to the downstream gages on the river (Zolfo Springs and Arcadia), the P5 low flows remained fairly high before the year 2000 then dropped to lower values in very dry periods since then. I have no work experience in Payne Creek and don't know if possibly there were changes in discharges from mines or other facilities may have influenced these values, but there were droughts in 1981 and 1985 and low P5 values would have been expected then as well.

Of special significance to the Peace River is Shell Creek, which as described on page 9, comprises the largest tributary sub-basin in the river watershed and has the highest average flow (348 cfs), for comparison purposes since 1975 (Table 3). Shell Creek is located the southeastern region of the Peace River watershed, flowing into the Peace River about nine miles upstream of the river mouth at Charlotte Harbor. Shell Creek is impounded by a low-head weir about six miles upstream of it confluence with the river. During the dry season, brackish water from the estuarine reaches of the Lower Peace River extend up to the weir. The USGS streamflow gage Shell Creek near Punta Gorda measures freshwater flow over the top of the weir. The City of Punta Gorda has obtained municipal water supplies from the small reservoir created by the weir since the 1940s. Water use as increased slowly over the years, with yearly water use rates of 2 to 3 million gallons per day (mgd) in the 1970s increasing to a maximum average water use rate of 5.4 mgd (equal to 8.4 cfs) in 2017. For much of the year, the water use by the City of Punta Gorda comprises a small fraction of the flow at the weir, but can comprise an appreciable portion of the flow during dry periods, resulting in brief periods of near zero flow at the weir during droughts.

Hydrographs of yearly flow parameters for Shell Creek at the weir are shown in Figure 25. Withdrawals by the City of Punta Gorda were added into the flow record to represent changes in the total flow of Shell Creek over time. Although the flow records start in 1965, the horizontal axis goes back to 1950 for easier comparison to the hydrographs for Charlie, Horse, and Joshua Creeks. There are no visually apparent flow trends with Shell Creek, but the P5 low flows show a period of relatively high values in the 1990s due to climatic conditions. It is also noted the P5 flows were lowest in the 1970s, even though there were several very dry years between the 2000 and 2009. Similar to nearby Joshua Creek, evidence indicates that increased agricultural land use and irrigation has contributed to increasing low flows in the Shell Creek sub-basin (PBS&J and others, 2007).

For a more quantitative comparison of changes of flows in the creeks compared to the river, the non-parametric Mann-Kendall test was applied to the yearly flow parameters over time and a linear regression of each flow parameter as a function of year was developed. The results of these statistical tests for the four tributaries where flow records extend prior to the 1970s are presented in Table 6, along with results for the three long-term gages on the river (Bartow, Zolfo Springs, and

Table 6. Results of trend tests of yearly flow statistics (means, P5, median, and P90 flows) for three long-term gages on the Peace River and Charlie, Horse and Joshua Creeks for the period 1951 to 2017, with the period for Shell Creek beginning in 1965. Results are presented for (A) the non-parametric Mann-Kendall test and (B) linear regression of each yearly flow statisitc as a function of year. P is the probability of type 1 error or that there is no trend. P values less than 0.10 are highlighted in bold.

		A. Mann-Kendall		B. Linear Regression			
Gage, flow period, and yearly statistic tested for trend		**Tau**	**p**	**Slope cfs per year**	**p**	**Slope as % of mean value**	**Slope as % of median value**
Average Yearly Flows							
Charlie Creek	(1951-2017)	-0.029	0.725	-0.84	0.4060	0.32%	-0.38%
Horse Creek	(1951-2017)	-0.058	0.458	-0.58	0.4110	0.31%	-0.33%
Joshua Creek	(1951-2017)	0.083	0.322	0.03	0.5025	0.02%	0.02%
Shell Creek	(1965-2017)	0.154	0.1039	2.38	0.1110	0.65%	0.69%
Peace nr. Bartow	(1951-2017)	-0.184	**0.0276**	-2.30	**0.0270**	1.13%	-1.46%
Peace at Zolfo Springs	(1957-2017)	-0.163	**0.0508**	-4.25	**0.0440**	0.75%	-0.92%
Peace at Arcadia	(1951--2017)	-0.099	0.2366	-5.91	**0.0995**	0.59%	-0.62%
Yearly P5 (Low) Flows							
Charlie Creek	(1951-2017)	-0.041	0.6222	-0.03	0.4510	0.45%	-0.38%
Horse Creek	(1951-2017)	-0.099	0.2360	0.03	0.4616	0.57%	1.02%
Joshua Creek	(1951-2017)	0.500	**<.0001**	0.18	**0.0247**	2.30%	3.20%
Shell Creek	(1965-2017)	0.190	**0.0440**	0.25	0.2579	0.92%	1.43%
Peace nr. Bartow	(1951-2017)	-0.527	**<.0001**	-0.99	**<0.0001**	**3.48%**	**-5.80%**
Peace at Zolfo Springs	(1957-2017)	-0.489	**<.0001**	-2.15	**<0.0001**	**2.12%**	**-2.47%**
Peace at Arcadia	(1951--2017)	-0.369	**<.0001**	-2.20	**<0.0001**	**1.70%**	**-2.12%**
Yearly P50 (Median) Flows							
Charlie Creek	(1951-2017)	-0.099	**0.2380**	-0.72	**0.0940**	0.90%	-1.25%
Horse Creek	(1951-2017)	-0.084	0.3167	-0.44	0.1208	0.79%	-1.15%
Joshua Creek	(1951-2017)	0.281	**0.0008**	0.33	0.1044	1.04%	0.36%
Shell Creek	(1965-2017)	-0.032	0.7357	-0.32	0.6420	0.21%	0.23%
Peace nr. Bartow	(1951-2017)	-0.327	**<.0001**	-2.57	**0.0003**	2.19%	-3.10%
Peace at Zolfo Springs	(1957-2017)	-0.268	**0.0014**	-3.96	**0.0021**	1.19%	-1.36%
Peace at Arcadia	(1951--2017)	-0.204	**0.0144**	-5.87	**0.0056**	1.16%	-1.43%
Yearly P90 (High) Flows							
Charlie Creek	(1951-2017)	-0.022	0.7909	-2.160	0.4900	0.28%	-0.33%
Horse Creek	(1951-2017)	-0.075	0.3719	-1.596	0.4222	0.30%	-0.36%
Joshua Creek	(1951-2017)	0.007	0.4232	0.674	0.5354	0.23%	0.26%
Shell Creek	(1965-2017)	0.149	0.1141	7.420	0.1253	0.74%	0.87%
Peace nr. Bartow	(1951-2017)	-0.101	0.2254	-3.030	0.2638	0.59%	-0.76%
Peace at Zolfo Springs	(1957-2017)	-0.082	0.3299	-5.190	0.3370	0.39%	-0.46%
Peace at Arcadia	(1951--2017)	-0.052	0.5373	-10.535	0.2906	0.41%	-0.45%

Arcadia). For a consistent comparison, the trend tests for all ages begin with flows recorded in 1951 for all gages, except Shell Creek where the flow records begin 1965. Trend tests were not performed on Payne Creek due to the shorter period of record.

The results in Table 6 should be interpreted as described on pages 12 and 13 for Table 4, which listed results for the same statistical tests over a different time period (1940 to 2017). Again, p values for tests had significance levels of less than 0.1 are highlighted in bold. Again, there was a tendency for significant declining trends for the gages on the river. This was not the case for the P90 high flows, where the p values were relatively high indicating no trend. Also, there was no significant trend for average annual flows for the Peace River at Arcadia using the Mann-Kendall test, but the results for the yearly P5 and median flows for all three long-term gages on the river had significant declining trends using both the tests. Again, the trends were most pronounced at the Bartow gage, as evidenced by the larger Tau values, the greater relative slopes using the linear regression, and the greater significance levels (lower p values) for both tests compared to the gages at Zolfo Springs and Arcadia.

Very different results were found for gages on the creeks for the post-1951 time period, although they experienced what were likely very similar climatic trends. There were no significant declining trends except for median flows on Charlie Creek. There were significant increasing trends P5 low flows and median flows on Joshua Creek, supporting the patterns in the long-term hydrographs shown in Figure 23. Again, these are smaller sub-basins with different hydrographic and hydrogeologic characteristics, but I believe the human impacts to flows in the Peace River, which are most acute in the upper river, also influence the differences in these results.

The trends for Shell Creek, which was over a shorter period of record (1965-2017), showed no evidence of declining trends. There was an increasing trend for P5 low flows in Shell Creek using the Mann-Kendall tests, and some evidence of an increasing trend in P90 high flows using both tests with p values of 0.1141 and 0.1253. These results should not be over-interpreted, or compared to the results for the river due to the different time periods analyzed. It can be concluded though, that in over fifty years of streamflow records for Shell Creek there is no evidence that the flows are declining.

Collectively, these results demonstrate how important the five major creeks from Payne Creek to Shell Creek are to sustaining hydrologic characteristics and ecological characteristics of the Peace River. It is again mentioned, however, that it does not appear that flows in the Peace River are in a steady rate of decline. Although statistical results are not presented, it appears there no continued declining trends at the gages on the river when the period of analysis starts in the 1970s, similar to the finding of other studies (Flannery and Barcelo, 1998; PBS&J and others, 2007; SWFWMD, 2010).

Instead, I conclude that impacts to the flows of the Upper Peace River that occurred over earlier decades extended into the 1970s and beyond. The flow regime of the river has how largely stabilized, but generally at less flows compared to pre-impacted conditions. The extent that flows have been reduced becomes more pronounced further upstream. In that regard, the flow contributions of the tributaries that have not been so impacted are very important to maintaining the existing environmental characteristics of the Peace River and make the feasibility of achieving additional water supplies from the river much more likely at locations farther downstream.

The withdrawal of high flows - considerations for intake locations and designated water uses

It is interesting that the trend analyses beginning in 1951 did not find significant trends in the high flow parameter that was tested (yearly P90 flows), but that could probably be expected. It may be that given enough rainfall, some of the impacts to the river are overcome and high flow rates occur similar what occurred in earlier decades. Metz and Lewelling (2009) suggest that the filling of cavities and voids below the Upper Peace River above Ft. Meade occurs at an increasing rate at the beginning of the summer wet season, so losses to the groundwater system might be reduced later in the wet season as these voids are filled. Prolonged high flows during other times of year may function similarly. Also, storm runoff rates from some urban and agricultural lands in the Peace River watershed are probably higher than occurred from more natural, pre-development land covers.

The continued of high flows during recent years is apparent in the daily records of the river. The report by SWFWMD (2002) made the interesting observation that after three years of severe drought, Tropical Storm Gabriel passed over the Peace River watershed in September 2001 and produced very high flows, resulting in a peak daily flow rate of 20,700 cfs at Arcadia, which with the exception of a similar peak flow of 20,900 cfs in 1960, had not been exceeded since 1949. Similarly, a peak flow rate of 21,700 cfs at Arcadia occurred in the summer of 2017, which is one of the highest daily flow rates on record. During this same event, the peak flow of 37,000 cfs from the four gages that contribute flow to the lower river (Peace-Arcadia, Horse, Joshua, and Shell Creeks) was the highest on record since 1965.

It is sometimes suggested that the high flows of the river be diverted from the Peace River and put into storage facilities for water supply. There certainly seems like a feasible scenario, but must be done with caution with regard to the quantities taken and the location of withdrawals. High flows perform important ecological functions in river systems, including transporting of large woody debris and organic matter, the inundation of floodplain wetlands, and the increase in habitat and food resources for fish and a variety of wildlife. Given the importance of high flows to river ecosystems, the determination of the best location and withdrawal quantities would require detailed study to simulate the effect of diverting different quantities of water at various rates of flow. It is not recommended that the diversion of low and medium flows be considered, as these components of the flow regime of the Upper Peace River have been most affected.

Withdrawals of high flows between Bowling Green and Zolfo Springs - As described on page 26, the morphology of the river channel changes below the confluence of Payne Creek near Ft. Meade. Above there, the river floodplain contains extensive areas of seasonally and semi-permanently flooded wetlands. As described in the minimum flows report for the Upper Peace River, the flow reductions in upper river have resulted in dramatic reductions in the hydroperiods of these wetlands (SWFWMD, 2002).

To prevent additional harm to these wetlands and the instream habitats of the upper river, I suggest that no withdrawals be allowed from the Upper Peace River or its tributaries above the confluence of Payne Creek, which is approximately nine miles south of Ft. Meade and two miles south of the town of Bowling Green. An exception to this might be the infrequent diversion of some very high flows from the upper reaches of the river that are inundating uplands, roads, homes or bridge crossings. Such diversions would have to be carefully assessed to not reduce the hydroperiods of riverine wetlands in the upper reaches of the river above Payne Creek.

The diversion and storage of high flows from the river below Payne Creek would be more hydrologically feasible and would have less potential ecological impacts. However, the location of any withdrawal point would have to be determined based on the physical characteristics of the river and its floodplain to avoid physical disruption of habitats as much as possible.

Withdrawals from such a location, however, should be prioritized for flow restoration of the upper river. The river is not meeting the minimum low flows adopted for the river at the Upper Peace River at the Zolfo Springs gage and evidence indicates the medium flows of the river have been impacted as well. In its proposed schedule for the adoption of minimum flows, the SWFWMD has scheduled the adoption of a full suite of minimum flows for the Upper Peace River for the year 2025. The determination of how much flow, if any, from the Upper Peace River above Zolfo Springs would be contingent on the establishment of those rules.

It is my preliminary conclusion that some diversion of high flows between Bowling Green and Zolfo Springs could be warranted it was used for the purposes of further restoration of the low and medium high flows above Zolfo Springs. Such diversions could be put into various pits in the upper river basin for storage and used to directly supplement the flows of the river in the dry season. Another possibility would be to use the stored river water for aquifer replenishment in the vicinity of the upper river. The report by Basso (2003) concludes that cutbacks in overall groundwater use to restore flow to Kissengen Spring and the Upper Peace River would be economically infeasible. However, aquifer replenishment of the Upper Floridan aquifer near the river channel might act to reduce losses of water from the river to the groundwater system. I suggest, however, that direct supplementation of the flow of the river would be more efficient.

Withdrawals of high flows between Charlie Creek and Arcadia - The next logical area for an intake structure would be in the middle Peace River between Zolfo Springs and Arcadia. To take advantage of the water contribute by Charlie Creek, the intake should be located below the confluence of Charlie Creek which is about 20 miles south of the Polk/Hardee county line. SWFMD has adopted minimum flow rules for the Middle Peace River which extends from Zolfo Springs to Arcadia (SWFWMD, 2005A). Any withdrawals from the river would have to comply with these minimum flows, which are established for three seasonal blocks which correspond to the spring dry season (Block 1 – April 20 to June 24), the summer wet season (Block 3 – June 25 to October 17), the period which typically has medium flows from the fall to the early spring (Block 2, October 28 to April 19).

It is my recommendation that diversions be limited to high flows, using the percentages for Block 3, which allows stepped flow reductions of 13% and 8% of natural flows, which are flows in the absence of other withdrawals. The change in allowable flow reductions occurs at a flow rate of 1,362 cfs at the Arcadia gage. I suggest that withdrawals between Charlie Creek and Arcadia be limited to high flows, for I believe the evidence indicates the low and medium flows in the river above Arcadia have been impacted to some extent. Finally, since more water would be available at a location below Charlie Creek as opposed to below Payne Creek, I suggest the water withdrawn below Charlie Creek could be used for both flow restoration of the upper river and water supply in Polk County.

Withdrawal point near Ft. Ogden - The optimal location to withdraw fresh water from the Peace River to maximize water supply availability while minimizing the potential for environmental impacts is at or near the location of the intake structure of the Peace River Manasota Regional Water Supply Authority near Ft. Ogden. Located 19 miles upstream of the mouth of river, the intake is in the tidal reach of the river as there is often about a two foot daily fluctuation of water levels at the intake due to tides. This water is usually fresh, but during low flows brackish water can occur at the location of the intake. When this happens, withdrawals cease and the PRMRWSA relies on water that has been diverted into storage. This cessation of withdrawals also has the ecological benefit of preserving all the flows to the downstream estuary during low flows when the inflow of freshwater is particularly critical.

The existing withdrawal point is actually on small backwater slough off the west side of the river. Because of the large volumes of water associated with tides, withdrawals at this location have very small effects on water levels and rates of flow near the intake and no effect on the upstream non-tidal freshwater reaches of the river. Preserving flows in the upstream reaches of the river for the needs of the freshwater ecosystem makes sense, with withdrawals taken downstream at this location where there is more water available for supply.

If sea level rise increases the time that brackish waters occur at the PRMRWSA intake, a supplemental intake for use during low flows could be implemented farther upstream, whereas the existing intake could be used at higher flows as freshwater flow physically pushes the brackish water further downstream.

As with freshwater rivers, downstream estuaries also have ecological requirements for freshwater inflows, as the ecological structure and biological productivity of these brackish water ecosystems are dependent on the quantity and quality of freshwater inflow. The SWFWMD has done extensive research on the freshwater flow needs of estuaries, including many years of study of the Lower Peace Rive and adjacent waters of Charlotte Harbor (Flannery and others, 2002; SWFWMD, 2010; Atkins Inc., 2013; CHNEP, 2016).

The results of this research were incorporated into the adoption of minimum flows for the Lower Peace River (SWFWMD 2010). Those minimum flows are based on the sum of daily flows at the Peace at Arcadia plus Horse and Joshua Creeks, which represents 73 percent of the area of the Peace River watershed. The minimum flows for the lower river establish a low flow cutoff for surface water withdrawals of 130 cfs, which on average the flow is below about 13 percent of the time, but can be much more frequent in dry years.

Similar to the minimum flows for the Middle Peace River, the minimum flows are established for the same three seasonal blocks as for the middle river described on page 35. The maximum allowable flow reductions allowed for the Blocks are 16% of flow in Block 1 (spring dry season); 29% of flow in Block 2 (fall to early spring); and 38% of flow in Block 3 (summer wet season). However, withdrawals in Blocks 2 and 3 must remain at the Block 1 percentage (16%) until the daily flows exceed 625 cfs, when the percentages for those Blocks take effect.

It is important to note that flow reductions percentages for the lower river are higher than for the middle reach of the river, thus allowing greater withdrawals for the same rate of flow. The health of productivity of estuaries are dependent on freshwater inflow, but it has my experience that freshwater rivers are more sensitive to harm as a result of flow reductions. As is the case with the Peace River, minimum flows established for freshwater systems using the District's percent-of-flow approach are more typically more restrictive (lower percent flow reductions) than for estuarine systems.

The previously described, the Peace River Manasota Regional Water Supply Authority is an existing legal user of flow at Ft. Ogden and they would get first priority for use. The permitted withdrawal schedule for the PRMRWSA is based on the percent of flow approach, at or very close to the maximum allowable withdrawal percentages allowed by the minimum flow rule for the lower river during Blocks 1 and 2 (fall to late spring). However, during these blocks there may be days when the PRMRWSA does not withdraw all the water it is allowed due to reduced customer demands or full storage. On such days, it would not be difficult to determine how much flow could be available to other users while remaining in the minimum flow limits for the Lower Peace River.

In the summer wet season (Block 3), the PRMRSA is permitted to withdraw 28% of the flow above a flow rate of 625 cfs, while the minimum flow rule allows for a flow reduction of 38 percent, thus there are additional high flows available for other users. The SWFWMD is currently reevaluating the minimum flows for the Lower Peace River with adoption scheduled for the year 2020. This might require that the withdrawal schedule for the PRMRWSA be revised to comply with the minimum flows if they are changed. At that time, the potential use of high flows by other water users could be assessed.

The value of a lager interconnection with Shell Creek - In addition to the different flow requirements of freshwater and estuarine systems, compared to the upper river, there is simply much more water in the Lower Peace River just before it flows into the estuary. As listed in Table 1 and discussed on page 5, it is reiterated that the mean flow of the lower river at the confluence with Shell Creek (1,547 cfs) is greater than the average flow at Ft. Meade (195 cfs) by nearly a factor of eight.

A major component of the increased flow in the lower river is Shell Creek, the largest tributary in the Peace River watershed. As previously discussed, the average flow for Shell since 1975 (368 cfs) is equivalent to 41% of the flow in the river at the Arcadia gage. As also previously discussed, the City of Punta Gorda makes water supply withdrawals from the reservoir behind the Shell Creek weir, with the highest average rate of water use to date being 5.4 mgd in 2017 (equal to 8.4 cfs). The water use permit for the City of Punta Gorda allows for a maximum average annual withdrawal rate of 8.1 mgd (12.5 cfs) and a peak monthly rate of 11.7 mgd (18.1 cfs). Even if the City pumps close to those quantities in future years, there will be much of the year when the City's withdrawals will comprise a relatively small percentage of flow in Shell Creek and additional water may be available for other users.

The SWFWMD did not establish minimum flows for Shell Creek when it adopted minimum flows for the Lower Peace River in 2010. However, the SWFWMD is intending that minimum flows for Shell Creek be established as part of the reevaluation of minimum flows for the Lower Peace River, which are scheduled for adoption in 2020. The determination of those minimum flows will determine how much flow in Shell Creek can be reduced by all water users. I expect that when minimum flows are adopted, the City's withdrawals utilize all the available water from Shell Creek at low and low-medium flows, but there will be considerable water available for other users at medium and high flows.

It is my understanding there is a cooperative project has been funded to build a pipeline between the PRMRWSA water treatment facility on the Lower Peace River and the City's facility on Shell Creek. It is also my understanding this pipeline, which has not yet been constructed, will be for treated water to help either utility meet water supplies when flows are low in either the river or the creek.

This project is a good idea, but I suggest that if a watershed-wide plan is employed to meet regional water supply needs using the Peace River, a larger pipeline would be valuable to transmit greater quantities of untreated river water between these two facilities for storage or treatment. This would allow for the high flows in Shell Creek to be made available for use on a larger regional scale.

Construction of pipeline and water storage facilities to make water from the Lower Peace River and Shell Creek available to upstream water users

I am unfamiliar with projected water supply needs of the PRMRWSA and the City of Punta Gorda for the resource planning horizon. However, given that high flows periodically occur in the Peace River including Shell Creek, it seems possible that additional water could be made available for upstream water users. The withdrawals should be taken at or near the location of the PRMRWAS facility as it is in the optimal location for maximizing water supply availability while minimizing the potential for environmental impacts.

The flow reduction limits established by the minimum flow rule for the Lower Peace River would apply to the total percentages of water that can be withdrawn by all users. If necessary at this time, I suggest the existing minimum flow rule with some possible withdrawal scenarios assigned for Shell Creek could be used for feasibility assessments. The final total withdrawal amounts, however, would have to be resolved when the minimum flows for the Lower Peace River including Shell Creek are adopted in 2020.

Associated parties would have to work out how much of the water would be available for the different users and their customers at different rates of flow. As stated before, the withdrawals by the PRMRWSA should be first priority as they are an existing legal user. The withdrawal schedule for the PRMRWA comprise the allowable minimum flow percentages at low and medium flows, but as previously discussed there might be days when they do not take all their permitted quantities, thus periodically making water available for other users. As is the case the PRMRWSA's current withdrawal schedule, during high flows there should routinely be additional available for other users on a routine basis.

Implementation of such a watershed-wide supply plan would require the construction of a pipe to transport water upstream. In additional water storage facilities would need to be located somewhere in the Peace River corridor to store water during high flows for later use. For reference, it is about 37 linear miles from the PRMRWA water treatment plant to the Polk County line.   Construction of such a pipeline and water storage facilities would require considerable funds, but I suggest that if the water supply simulations indicated that the water supplies were feasible and needed for upstream water users, the project would be valuable to the region.

The Upper Peace River has been seriously impacted by industrial and agricultural activity and population growth in the upper river sub-basin, much of which occurred before adequate regulatory and resource planning tools were in effect. To varying degrees based on river location, these hydrologic and ecological impacts have extended some distance downstream. If new water supplies are from the river are truly needed, the expenditure of public funds to transport water from more resilient downstream locations to upstream water users would be well justified to make such water supplies available without causing further environmental harm to the Peace River.

The section on the Alafia River begins on the following page

Alafia River

Overview

A discussion of considerations for the implementation of any new surface water withdrawal sites for water supply from the Alafia River is presented below. This discussion is shorter than that presented for the Peace River, but makes the same conclusion that any new withdrawals from the river or its tributaries should be located as far downstream as possible to maximize water supply availability while minimizing the potential for adverse environmental impacts.

The physical and hydrologic characteristics of the Alafia River and its watershed are briefly summarized in a very general manner. Much more detailed information about the Alafia River and its watershed is contained in SWFWMD minimum flows reports for the freshwater and lower estuarine reaches of the river (SWFWMD, 2005B; SWFWMD, 2008).

Hydrographic and watershed characteristics

The Alafia River has headwater reaches in western Polk County, but it flows primarily through Hillsborough County to Tampa Bay. The total watershed area of the river is 422 square miles. The total length of the Alafia is 50 miles, including the channel of its longest headwater tributary.

A map of the Alafia River including its major tributaries, springs, and flow measurement stations is shown in Figure 26. The north and south prongs of the river flow together near Alderman's Ford near State Road 39 to form the Alafia River which flows 25 miles to the mouth of the river at Tampa Bay. Tampa Bay Water has an intake site on the south bank of the river just upstream of Bell Shoals Road, approximately 12 miles above the mouth of the river (Figure 26). The river becomes tidally affected a short distance below Bell Shoals Road and brackish waters can extend approximately 10 to 11 miles upstream of the river mouth during low flows.

Flows in the Alafia River have been measured since 1932 by the USGS at the Alafia River near Lithia gage, located 16 miles upstream of the mouth of the river. Long-term USGS flow gages are also in operation on the north and south prongs of the river, with the records extending back to 1950 for the north prong and 1962 for the south prong. The Alafia River also receives flow from two spring complexes. Lithia Springs flows to the river approximately 14 miles upstream of the river while Buckhorn Springs flows into the estuarine reach of the river via a spring run that enters the river about eight miles upstream of the river mouth. Flows records from these gages on the river and the springs are discussed in a later section of this report.

Hydrogeologic characteristics - Similar to the Peace River, there three principal aquifer systems in the Alafia River watershed; the unconfined surficial aquifer, the confined intermediate aquifer system, and the confined Floridan aquifer (UFA) system which is divided into upper and lower zones by a middle confining unit comprised of low-permeability zones.

The report by SFWMD (2005B) states that “due to the relatively thin and discontinuous nature of the sediments, groundwater flow in the surficial aquifer is more local in nature rather than regional. Flow direction is variable and is controlled primarily by the surface topography. Water levels from nearby wells and Alafia River stage indicate that the water table gradient slopes toward the river during both the dry and wet periods of the year (May and September), providing baseflow to the river all-year round. Conversely, water levels between the UFA and river stage suggest a seasonal pattern of flow, with potential recharge to the UFA (from the river) during the drier months and potential discharge from UFA (to the river) during the summer months.”

The report further states that “for the most part, water levels in the surficial aquifer are consistently higher than levels in the intermediate aquifer system and UFA, indicating a downward flow gradient. Along the coast, this downward gradient is typically reversed with water from the UFA being discharged upward into the overlying aquifers. However, for much of southern coastal Hillsborough County, water levels in the UFA have declined due to groundwater withdrawals. This has resulted in a seasonal reversal of the vertical gradient between the aquifers. During the drier periods of the year (typically the spring months) water levels decrease with depth along the coast and water moves downward from the surficial aquifer. During the remainder of the year, water levels in the UFA are higher and the vertical movement of water resumes in an upward direction.”

The report also described the region known as the Brandon Kart Terrain, an area of approximately 40 square miles located to the north of the Alafia River and west of Lithia Springs. The limestone is this area is dominated by karst topography including a high density of ancient and modern sinkholes, internal drainage, springs and significantly increased transmissivities in the limestone. The report also includes a section that summarized previous studies on the relationships of groundwater levels with springflow from Lithia and Buckhorn Springs and new results prepared for that study. They found there was strong correlation between groundwater levels in wells in and near the Brandon Karst Terrain and springflow, but the relationship was somewhat stronger for Lithia Springs than Buckhorn Springs.

Land Use - The land use characteristics of the Alafia River basin are discussed in detail in the minimum flows report for the freshwater reach of the river (SWFWMD, 2005B). Table 10, which is reprinted from that report, list the percentages of major land use/cover types in the Alafia River watershed for the years 1972, 1990, and 1999. Maps of four of these land use types (urban, citrus, other agriculture and mines) are shown in Figure 27 which is also reprinted from SWFWMD (2005B). Also shown are coverages for rangeland, upland forests, wetland forests, non-forested wetlands, and water.

Table 7. Percentages of major land use and land cover types in the Alafia River watershed for 1972, 1990, and 1999. Adapted from SWFWMD (2005).

Land Use / Cover	1972	1990	1999
Urban	10.9%	13.9%	17.6%
Citrus	9.1%	4.9%	4.7%
Other Agriculture	26.9%	21.8%	18.4%
Uplands	30.7%	12.8%	10.1%
Wetlands	9.3%	12.1%	10.7%
Mines	10.9%	32.8%	35.9%
Water	2.3%	1.8%	2.5%

Along with the Peace River, the Alafia River is the notable for the extensive amount of phosphate mining that has taken in its watershed. The first evaluation of the possible effects of mining on the water quality and biology was presented in the 1955 report of the Florida State Board of Health about the Peace and Alafia Rivers, which was conducted in response to citizen concerns expressed about these rivers in the late 1940s (Florida State Board of Health , 1955A). As shown listed in Table 7 and shown in Figure 27, much of the increase in mined area occurred after 1972, with much of the increase occurring in the sub-basin of the south prong of the river. As of 1999, over one-third (35.9%) of the Alafia River watershed was affected by mining activities.

Since the early 1970s there has been marked decreases in the area of citrus, other agriculture and uplands, largely in response to increases in mining and urban development as urban land use increased from 10.9% to 17.9% of watershed area from 1972 to 1999. Urbanized areas include parts of the cities of Lakeland, Plant City, Mulberry and the community of Brandon which lies in the western portion of the watershed.

Streamflow statistics and trends

Summary statistics, hydrographs and trend analyses for the flow data at the long-term gages on the Alafia River and the north and south prongs are summarized below using data collected through 2017. Using previously published findings that were not updated with recent data, flows from Lithia and Buckhorn Springs are also characterized.

Table 8 lists average values for flow and area based runoff for the USGS gages on the main stem of the river and the north and south prongs. To use a consistent record for comparison, averages were taken for the 55 years of record since 1963, which is the first year of complete flow records for the south prong of the river. With an average flow of 142 cfs, the North Prong provides nearly half of the flow measured at the Alafia River at Lithia gage (298 cfs). With a smaller sub-basin area and average flow, the mean flow of the south prong (99 cfs) comprises one-third of the flow at the gage on the river. The remaining increase in flow at long-term river gages comes from drainage between these gage locations.

Average values for area based runoff are similar for the three gages, ranging from 0.89 cfs/mi^2 to 1.05 cfs/mi^2. These rates are as high or higher than the average runoff rates for the less impacted sub-basins in the Peace River watershed (Table 3), indicating there is not an apparent problem with human caused flow reductions in these sub-basins.

Table 8. Years with complete flow records, drainage areas, gage locations, and average values for flow and area-based runoff for long-term streamflow gages on the Alafia River including the North and SouthProngs for the period 1963 - 2017*

		Drainage area and location of gage		Average Flow and Runoff 1963 - 2017	
USGS gage	Years with complete records	Drainage area (mi^2)	Distance from the river mouth (miles)	Mean Flow (cfs)	Area Based Runoff (cfs/mi2)
Alafia River at Lithia	1933 - 2017	335	16	298	0.89
North Prong Alafia River at Keysville*	1951 - 2017	135	29	142	1.05
South Prong Alafia River nr. Lithia	1963 - 2017	107	34	99	0.92

*** No flow data for North Prong for Oct. 1, 1992 to June 30, 1995**

Percentile values for daily flows at these gages are listed in Table 9. As with average flows, there is an increase in all the percentile values at the gage on the river that is more than the sum of the values at the two gages on the north and south prongs. These results demonstrate there is potentially more water available for supply from the main stem of the river, rather than from two withdrawal points on the north and south prongs.

Hydrographs of yearly flow parameters at these three gages are shown in Figures 28, 29 and 30. The years on the horizontal axis for all the graphs begin in 1930 for easier comparison to the gage on the main stem of the river, where the period of record is the longest with the first year of complete daily records starts in 1933.

Table 9. Percentile values for daily flows for long-term gages on the Alafia River including the North and South Prongs for the period 1963 - 2017*									
	Flow Percentiles (cfs)								
USGS gage	**Minimum**	**P5**	**P10**	**P25**	**P50**	**P75**	**P90**	**P95**	**Maximum**
Alafia River at Lithia	4	35	54	96	172	346	642	932	9,820
North Prong Alafia River at Keysville*	2	19	26	46	83	152	289	455	9,550
South Prong Alafia River nr. Lithia	0	6	12	27	55	117	230	334	2,430

The plot of average yearly flows for the Alafia River at Lithia (Figure 28A) shows some similarly to the long-term gage for the Peace River at Arcadia (Figure 20) in that there were a higher frequency of high yearly mean flows (e.g., above 500 cfs) in the decades prior to the 1970s. Since that he 1970s, however, there has been no apparent trend. As was described for the Peace River, long-term patterns in regional rainfall, including the effects of the Atlantic Multidecadal Oscillation have affected these long term flow patterns. The minimum flows report for the freshwater reach of the Alafia River discusses this point and suggests that changes in flow in the Alafia River have been more of a step function due to changes in rainfall rather than a monotonic trend (SWFMWD, 2005B).

A notable pattern in the graphs for the river and also the north and south prongs is a rise in the yearly median and low (P5) values from the late 1950s to the late 1970s or the early 1980s (graphs B and C in Figures 28, 29 and 30). Both minimum flow reports for the Alafia Rive attribute this to runoff and discharges from the phosphate mining industry during that time (SWFWMD, 2005B, 2008). As in the Peace River watershed, the phosphate mining industry has become much more efficient in their groundwater use and retention of water onsite so that such discharges to the river are now much less. This is corroborated by the significant reduction in the concentrations of a number of chemical constituents (e.g., phosphorus, fluoride, sulfate, specific conductance) that had been previously elevated due to mining activities.

All three gages show the lowest values for P5 low flows since the year 2000. As described on page 11, the high frequency of very dry years which has occurred since the year 2000 has certainly been a major factor in this pattern. However, in the preparation of this report I did not do an inventory of past or current point sources discharges to either the north of south prongs of the river. It may be that changes in point source discharges could affect the long-term patterns in low flows, but that is a topic I did not consider.

In addition to the presentation of hydrographs, trend tests on yearly flow parameters were run on the three gages for two time periods. The first was for the entire period of years with complete daily records for the Alafia River at Lithia (1933-2017) and the North Prong of the

Alafia River nears Keysville (1951-2017). In order to compare results within a consistent time period, trends at these gages were examined along the South Prong of the Alafia River for the years 1963 to 2017, which is the period of complete daily records for the south prong.

The long-term, period of record trends for the Alafia River and the north prong are listed in Table 10. These results should not be compared since they are over different time periods, with flow records for the river gage starting 18 years before the north prong. There were significant declining trends for average yearly flow at both gages, with changes in long-term rainfall likely playing a major factor. Declining trends in median flows and P5 low flows were also found for the north prong, which was influenced by the period of increased flows from phosphate mining activity which was occurring near the beginning of that flow record (Figures 29 B&C). Since this period of increased flows occurred toward the middle of the flow record for the Alafia River gage (Figure 28 B&C), it did not result in a statistically significant declining trend.

There were significant declining trends in P90 high flows for the gage in the river, due in part to the frequency of high flows in the year up to 1960 (Figure 28D). Significant trends in high flows were not found for the north prong, as what were probably high flows in the 1940s were not measured at this site where the flow records began in 1951.

Table 10. Results of trend tests of yearly flow statistics (means, P5, median, and P90 flows) for the Alafia River at Lithia for 1933 to 2017 and for the North Prong of the Alafia River near Keysville for 1951 to 2017. Results are presented for (A) the non-parametric Mann-Kendall test and (B) linear regression of each yearly flow statisitc as a function of year. P is the probability of type 1 error or that there is no trend. P values less than 0.10 are highlighted in bold.

	A. Mann-Kendall		B. Linear Regression			
Gage and yearly statistic tested for trend	Tau	p	Slope cfs per year	p	Slope as % of mean value	Slope as % of median value
Average Yearly Flows						
Alafia River at Lithia (1933-2017)	-0.180	**0.0148**	-1.58	**0.0165**	-0.48%	-0.52%
North Prong at Keysville (1951-2017)	-0.134	0.1155	-0.80	**0.0804**	-0.53%	-0.61%
Yearly P5 (Low) Flows						
Alafia River at Lithia (1933-2017)	-0.055	0.4569	-0.09	0.5859	-0.16%	-0.18%
North Prong at Keysville (1951-2017)	-0.358	**<.0001**	-0.56	**<.0001**	-1.60%	-2.01%
Yearly P50 (Median) Flows						
Alafia River at Lithia (1933-2017)	-0.045	.5436	-0.22	0.5481	-0.12%	-0.14%
North Prong at Keysville (1951-2017)	-0.344	**<.0001**	-0.97	**<.0001**	-1.11%	-1.17%
Yearly P90 (High) Flows						
Alafia River at Lithia (1933-2017)	-0.182	**0.0138**	-3.96	**0.0104**	-0.55%	-0.60%
North Prong at Keysville (1951-2017)	-0.026	0.7598	-0.38	0.7302	-0.12%	-0.14%

Results for trends tests at all three gages for the period 1963 – 2017 are listed in Table 11. There were no significant trends for average yearly flows, although p values for the Mann-Kendall test for the river gage was near 0.10. Significant declining trends were observed for median and P5 flows for the river and the north prong, again due to the period of increased flows due to mining activity which were in effect in the 1960s and 1970s. Significant declining trends were observed for the P5 low flows in the south prong, but not for median flows where there has been a number of high yearly median flow values since the mid-1990s (Figure 30B).

The hydrographs show there was an increase in average yearly flows and P90 high flows at all three gages since 2014, due to years with average or above average rainfall since that time. There was also no evidence of trend for P90 high flows at all three gages since 1963. Although this is just one flow parameter, this does indicate that the high flows of the river and its tributaries have continued to fluctuate in ecologically healthy range for the last 50-plus years and that some high flows could possibly be withdrawn for water supplies without causing adverse impacts to the river ecosystem.

Table 11. Results of trend tests of yearly flow statistics (means, P5, median, and P90 flows) for the Alafia River at Lithia, the North Prong of the Alafia River near Keysville and the South Prong of the Alafia River near Lithia for 1963 to 2017. Results are presented for (A) the non-parametric Mann-Kendall test and (B) linear regression of each yearly flow statisitc as a function of year. P is the probability of type 1 error or that there is no trend. P values less than 0.10 are highlighted in bold.

	A. Mann-Kendall		B. Linear Regression			
Gage and yearly statistic tested for trend	**Tau**	**p**	**Slope cfs per year**	**p**	**Slope as % of mean value**	**Slope as % of median value**
Average Yearly Flows						
Alafia River at Lithia (1963-2017)	-0.150	0.1055	-1.12	0.2622	-0.38%	-0.41%
North Prong at Keysville (1963-2017)	-0.123	0.1922	-0.55	0.2804	-0.39%	-0.43%
South Prong near Lithia (1963-2017)	-0.137	0.1406	-0.52	0.1960	-0.53%	-0.57%
Yearly P5 (Low) Flows						
Alafia River at Lithia (1963-2017)	-0.494	**<.0001**	-1.51	**<.0001**	-2.42%	-2.52%
North Prong at Keysville (1963-2017)	-0.535	**<.0001**	-0.95	**<.0001**	-2.79%	-3.43%
South Prong near Lithia (1963-2017)	-0.290	**0.0018**	-0.29	**0.0028**	-1.89%	-2.26%
Yearly P50 (Median) Flows						
Alafia River at Lithia (1963-2017)	-0.286	**.0020**	-1.77	**0.0040**	-1.00%	-1.06%
North Prong at Keysville (1963-2017)	-0.431	**<.0001**	-1.41	**<.0001**	-1.67%	-1.76%
South Prong near Lithia (1963-2017)	-0.139	0.1347	-0.33	0.2160	-0.55%	-0.64%
Yearly P90 (High) Flows						
Alafia River at Lithia (1963-2017)	-0.062	0.5042	-0.41	0.8580	-0.06%	-0.07%
North Prong at Keysville (1963-2017)	0.011	0.9084	1.08	0.4066	0.36%	0.41%
South Prong near Lithia (1963-2017)	-0.070	0.4502	-0.88	0.3732	-0.39%	-0.33%

Flows and Withdrawals below the Alafia River at Lithia gage

Lithia and Buckhorn Springs - With regard to maximizing water supplies while minimizing the potential for environment impacts, it is important point out the Alafia River gains considerable flow below the Alafia River at Lithia gage. Lithia and Buckhorn Springs flow into the river below this gage so they are not reflected in the long-term flow records reported there.

I did not acquire recent flow data for Lithia and Buckhorn Springs, but present data for the springs taken from the minimum flows report for the Lower Alafia River, which reported data through the year 2003 (SWFMD, 2008). Average flow data for these two spring complexes taken from that report are listed in Table 12. Flows from Lithia Springs have been measured periodically since the 1930s by the USGS and since 1984 by Tampa Bay Water (previously the West Coast Regional Water Supply Authority). Years with at least four flow measurements within each year begin in 1956.

Lithia Springs if used for industrial process water by Mosaic Fertilizer, with withdrawal records dating back to 1978. The average net flow from Litha Springs to the Alafia River uncorrected for withdrawals was 33.5 cfs for the period 1956-2003 and 29.8 cfs for the period 1978-2003. Correcting this more recent record for withdrawals by Mosaic, which averaged 6.7 cfs), the total flow of Lithia Springs was 36.5 cfs between 1978 and 2003. I did not access more recent withdrawals data by Mosaic and do not know if their withdrawals have gone up or down, but seem to recall that their withdrawals may have gone down in recent years.

Flows from Buckhorn Springs have been periodically measured by Tampa Bay Water since 1987. Buckhorn Springs is also used for industrial process water by Mosaic, but only very infrequently on an emergency basis if there are reasons why Lithia Springs cannot be used. The average flow of Buckhorn Springs to the river was 12.0 cfs for the period 1987-2003, while the total flow corrected for withdrawals was 12.7 cfs.

Table 12. Average rates of flow for Lithia and Buckhorn Springs for time periods through 2003, showing net flows to the river and total springflow corrected for withdrawals by Mosiaic Fertilizer, Inc. Values taken from SWFWMD (2008).

	1956 - 2003 (cfs)	1978 - 2003 (cfs)	1987 - 2003 (cfs)
Lithia Springs flow to the river	33.5	29.8	
Lithia Springs total flow corrected for withdrawals		36.5	
Buckhorn Springs flow to the river			12.0
Buckhorn Springs total flow corrected for withdrawals			12.7

Total flow to the Lower Alafia River including ungaged flow - In addition to flow from Lithia and Buckhorn Springs, the Alafia River gains considerable ungaged flow below the Alafia River at Lithia gage, which measures flow from 79% of the river watershed. Below this gage the river receives unmeasured flow from Fishhawk Creek, Bell Creek, and storm runoff from other ungaged areas. As part of the determination of minimum flows for the Lower Alafia River, the SWFWMD contracted the University of South Florida to develop and HSPF (Hydrologic Simulation Program – Fortran) runoff model for the ungaged areas that drain to the lower river (Tara and others, 2001). Model output was produced for 1989-2001, with the average ungaged flow equal to 37% of the average flow at the Alafia River at Lithia gage during that period.

Table 13 lists the estimated average total flow at the mouth of the Alafia River for the period 1989-2001, which is the sum of the following flows which are also listed; the flow at the Alafia River at Lithia gage, modeled ungaged flows, and recorded flows from Lithia and Buckhorn Springs uncorrected for withdrawals by Mosaic Fertilizer. The average total flow was 369 cfs, with the flow at the long-term gage representing 65% of the estimated total flow. By comparison, the combined gaged flow for the north and south prongs of the river during this period was 204 cfs, equivalent to 52% of the total flow at the mouth of the river.

Table 13. Average flows in the Alafia River for 1989-2001 expressed at cubic feer per second (cfs) and as pecent of the average total flow at the mouth of the river. Gaged flows are for the Alafia River at Lithia, the North Prong at Keysville, and the South Prong near Lithia.

	Total Flow at mouth	River Gage	Ungaged	Lithia Springs	Buckhorn Springs	North Prong	South Prong
cfs	396	259	96	30.1	10.5	119.5	84.5
Percent	100%	65%	24%	8%	3%	30%	21%

As with the Peace River, these data demonstrate their potentially more water available for supply the father the downstream that withdrawals are taken. Also, the physical and ecological characteristics of the river change downstream, which in turn affect its sensitivity to environmental impacts that can result from withdrawals.

Adopted minimum flows for the freshwater and lower segments of the Alafia River

Minimum flows for the Lower Alafia River were adopted in 2009, based on the minimum flows report published the previous year (SWFWMD, 2008). The adopted minimum flows for the Lower River allow a 19 percent reduction in daily flows above a low flow cutoff of 120 cfs, at which surface water withdrawals must cease. Flows to the Lower Alafia River are defined in the rule as the sum of the flow at Bell Shoals Road plus Buckhorn Springs, with the flow at Bell

Shoals Road calculated as the flow at the Alafia River at Lithia gage multiplied by a factor of 1.117, plus the flow from Lithia Springs corrected by withdrawals from Mosaic Fertilizer. Ungaged flow below Bell Shoals Road is not regulated under the rule, but the effects of the ungaged flow were included in the District's analyses that determined the minimum flows.

The SFWMD has also adopted minimum flows for the freshwater reach of the Alafia River, which are based on the flow at the Alafia River at Lithia gage. The first component of the minimum flow rule is a low flow threshold which prohibits any surface water withdrawals below a flow of 59 cfs at that gage. When flows are above 59 cfs the minimum flow rule allows different withdrawal percentages of daily flows within the same three seasonal blocks as established for the Peace River which correspond to the spring dry season (Block 1 – April 20 to June 24), the summer wet season (Block 3 – June 25 to October 27), the period which typically has medium flows from the fall to the early spring (Block 2, October 28 to April 19).

The maximum allowable percentage flow reductions are also based on the Alafia River at Lithia gage and are 10% of daily flow in Block 1, 15% of daily flow in Block 2, and 13% or 8% of the daily flow in Block 3, switching to the lower percentage when flows at the gage fov 374 cfs, which is 25% exceedance flow of the river at that site.

As with the Peace River, these allowable percentage flow reductions for the freshwater reach of the Alafia are more restrictive than the minimum flows rule for the Lower Alafia River, which allows for a 19% reduction in daily flow year-round. As with the Peace River, the withdrawal percentages needed to protect the tidal part of the Alafia River are not as restrictive as allowable flow percentages for the upstream freshwater segment of the river.

The minimum flow for the lower river does have a more restrictive low flow cutoff (120 cfs), but this is calculated as the flow at Bell Shoals Road plus the flow of Buckhorn springs. Because of its location downstream, the low flow threshold for the lower river supercedes the low flow threshold of the freshwater reach, and would apply to any new water users whether they are on the main stem of the river or the north or south prongs.

Suitable location for additional withdrawals from the Alafia River

The effect of the differences in the minimum flow rules for the freshwater and lower reaches of the Alafia River, combined with the hydrologic statistics of the river presented in Tables 9, 12 and 13, demonstrate that there is much more water available for supply farther downstream.

Impracticality of withdrawals from the north and south prongs - Withdrawals from the north of south Prongs of the Alafia River would yield much less water and deprive much longer lengths of the river and its tributaries of freshwater flow. A photograph of the North Prong of the Alafia River about a mile upstream of the confluence with the south prong is shown in

Figure 31. The north and south prongs are not rivers but instead are creeks, with a high degree of ecological sensitivity and very limited water supply yield. With regard to environmental protection and regional water supply concerns, there should be no practical reason to allow new withdrawals from either the north or south prongs of the Alafia River. Similarly, withdrawals s from the Alafia River should be located are far downstream as possible.

Withdrawals By Tampa Bay Water near Bell Shoals Road The location of the Tampa Bay Water Intake just upstream of Bell Shoals Road is in an optimal location to maximize water supply availability as it is just above the tidal estuarine reach of the river (Figure 26). Diversions at this site are piped either to a water treatment plant located to the north near the Tampa Bypass Canal or to the C.W. "Bill" Young reservoir, which is an offstream reservoir located approximately six miles southeast of the intake on the river.

Withdrawals at this location have only a minor effect on affect water levels and velocities near and downstream of the intake and no effect on the freshwater segment of the river upstream. The withdrawals, however, do affect flows to the Lower Alafia River, which becomes tidally affected a short distance below Bell Shoals Road. The ecological flow requirements of the downstream tidal estuary are critical, but those have been accounted for in the determination of minimum flows for the Lower Alafia River (SWFWMD, 2008).

The withdrawals schedule currently permitted to Tampa Bay Water is in compliance with the 19% flow limit contained in the minimum flow rule for the Lower Alafia River, as TBW is allowed to take 10 percent of the preceding daily flow at Bell Shoals, which is calculated as flow at the Alafia River near Lithia gage * 1.1117, plus the net flow of Lithia Springs uncorrected for withdrawals by Mosaic Fertilizer. In addition, withdrawals by Tampa Bay Water cannot reduce the flow at Bell Shoals Road below a daily flow rate of 124 cfs.

As a result, there is more water available for supply at the Bell Shoals Road than is currently permitted to Tampa Bay Water. I have no idea of the regulatory or policy matters might concern the transfer of water between counties or hydrologic basins and leave that for others to consider. Plus, Tampa Bay Water is an existing legal user of the Alafia River and I don't know how the Alafia factors into their needs for water supplies in the future. If considered to be feasible, any withdrawals at this location for other users would require analyses of water conveyance and storage facilities which are beyond the scope of this report.

Possible reevaluation of minimum Flows for the Lower Alafia River

I suggest that the minimum flows for the Lower Alafia River could be reevaluated at a future date, as the District periodically reevaluates the minimum flow rules it has adopted. I was the principal scientist who wrote the minimum flows report for the Lower Alafia River (SWFWMD, 2008) and believe the 120 cfs low flow threshold and the 19% withdrawal limit are effective limits for making water available for supply while protecting the lower river from significant harm at low and medium flows. However, there may be the possibility of withdrawing somewhat higher percentages of water at high flows.

If it is concluded that additional water supplies are needed from the Alafia River and the diversion of higher withdrawal percentages could help achieve those needs, the SWFWMD could schedule the reevaluation of the minimum flows of the Lower Alafia River. As with the existing minimum flow rule, the SFWMD would have to perform technical analyses to demonstrate that the revised minimum flows would not cause significant harm to the ecology of the Lower Alafia River. However, the existing 19% of flow rule already allows for substantial quantities of water to be diverted at high flows, so a reevaluation may not be necessary if the existing minimum flow rule allows the Alafia to effectively meet regional water supply needs within the resource planning horizon.

General application of findings from the Peace and Alafia Rivers to other rivers in the region

As should be painfully obvious to readers by now, the principal concept of this report is that a watershed based approach should be used to identify locations on rivers where water supply availability can be maximized while at the same time minimizing the potential for adverse environmental impacts. To a large extent, the considerations described for the Peace and Alafia River in this report can be applied to other rivers in west-central Florida as well.

One important factor that applies throughout the region is that the rivers are small. With a total length of 106 miles, the Peace River is the second longest river in Southwest Florida Water Management District, second only to the Withlacoochee River which has a total length of 157 miles. Estevez and others (1991) identified seven other primary rivers in the region in which flows are dominated by surface drainage; which are the Myakka, Manatee, Little Manatee, Alafia, Hillsborough, Anclote, and Pithlachascotee Rivers. The total lengths of these rivers range from 34 to 54 miles with an average total length of 44 miles. As these rivers all occur along the Gulf coast, brackish waters can extend upstream considerable lengths in the dry season, with the maximum upstream penetration of waters with mineral concentrations over potable water supply standards averaging about 13 miles upstream of the mouth. As a result, the lengths of these rivers that can be used for potable water supply are even shorter.

Given the short length of these rivers, it makes sense to consider withdrawal points that can maximize water supply yields and minimize environmental impacts, even if the withdrawal point is located some distance downstream from the actual point of water use or storage. As was shown for the Peace and Alafia, the greatest quantities of freshwater flow available for supply will be just above where the river enters its tidal reach.

Secondly, the ecological health of freshwater and estuarine ecosystems are both dependent on freshwater flow, but the relationships of the physical, chemical, and biological characteristics of these ecosystems with flow are very different. For this reason, the SWFWMD evaluates minimum flows separately for the freshwater and the tidal estuarine reaches of rivers.

In freshwater rivers the withdrawal of freshwater has immediate effects on water levels and current velocities and resulting direct effects on the river's biology over time. In estuaries the effects of withdrawals on water levels and velocities are diminished by the volume of water exchanged by tides. However, freshwater inflows have critical functions in maintaining healthy estuaries including effects on salinity distributions, circulation, primary production, the delivery of nutrients and organic matter and the distribution and productivity of many estuarine dependent animals of sport and commercial importance.

For the management of withdrawals from unimpounded rivers, the SWFWMD has utilized a percent-of-flow approach, that limits withdrawals to a percentage of flow at the time of the withdrawal which can vary between seasons and flow ranges (Flannery and others, 2000). This approach has been favorably reviewed as a progressive and effective water management method in the technical peer reviews that are conducted for each SWFWMD minimum flows report and in the general scientific literature (Alber, 2002; Postel and Richter, 2003; National Research Council, 2005).

Because of the different flow requirements of freshwater and estuarine ecosystems, the maximum percentage flow reductions allowed by the minimum flow rules adopted by the SWFWMD have differed between the freshwater and tidal reaches on each river. In the Anclote River the minimum flow percentages were fairly similar between the freshwater and estuarine reaches, but freshwater minimum flows requires a reduction in seasonal percentage withdrawals to 8% when flows in the river are above 138 cfs, whereas the estuarine minimum flows does not (SWFWMD, 2010B). As a result, the SWFWMD adopted the freshwater minimum flow rates for the entire Anclote River. In the Peace, Alafia and the Pithachascotee rivers, which are the other comparable examples, the minimum flows adopted for the estuarine segments allowed for higher percentage withdrawals than the freshwater segments and separate minimum flows were adopted.

Considering that there is more water is available for supply in the lower reaches of each river combined with the change in freshwater flow requirements between freshwater and estuarine ecosystems, it makes sense to implement withdrawals are far downstream as practically possible. As described in this report, this approach was taken by the regional water supply utilities the use the Peace and Alafia Rivers, as their intakes are optimally located to maximize water supply availability while minimizing the potential for adverse environmental impacts.

Another case of large scale withdrawals that are regulated using the percent-of-flow method are diversions from the Little Manatee River to a 4,000 acre offstream cooling pond for the Manatee power plant operated by Florida Power and Light Company. The intake for this facility, which was constructed in the 1970s, is located approximately 18 miles upstream of the mouth of the river and seven miles upstream of the maximum penetration of brackish water in the dry season. Although it would be preferable if this intake were located several miles downstream, this location is good in that the withdrawals affect only a fairly short portion of the freshwater reach of the Little Manatee River with no impacts extending upstream.

With the approach that has been implemented on these three rivers, flows are not affected in river above the intake where the maintenance of water levels and current velocities is particularly critical. Flows are withdrawn at a downstream location just above the estuarine reach where the requirements for freshwater flows are different due to the changes in the rivers physical, water quality, and ecological characteristics.

Sea level rise associated with global warming should be considered when assessing the new surface water withdrawal sites, as sea level rise will act to push brackish waters farther upstream. This however, can be accounted for in developing a withdrawal schedule that ceases surface water withdrawals during low flows when brackish waters occur at the intake, and then resume withdrawals when higher freshwater flows push brackish waters downstream. As described on page 37, this is currently the operational plan at the intake of the PRMRWAS facility on the Lower Peace River. If necessary, another alternative could be to develop a secondary intake father upstream to be used during times of low flow and maximum upstream brackish water penetration.

Minimum flows adopted for rivers by the SWFWMD typically have a low flow threshold for the cessation of surface water withdrawals, which can be implemented based on water quality or environmental protection. In tidal river estuaries, low flow thresholds have the benefit of preserving all the freshwater inflow during times of low flow when it is ecologically most critical, and are frequently in effect in the spring dry season when there is extensive use of tidal river ecosystems by estuarine dependent species (Flannery and others, 2002).

By locating the intake site as far downstream as possible, flows are preserved in the upstream reaches of the rivers which are most sensitive to impacts. Many of Florida's freshwater rivers have already been affected by non-point source pollution, nutrient enrichment, habitat alteration and the invasion of non-native plant, invertebrate and fish species. Over much of their flow regime the last thing these freshwater rivers need is to have their flows reduced.

Given the small size and short length of the region's rivers and their susceptibility to impacts, water supply plans that include the region's rivers should evaluate intake sites located as far downstream as possible. The funds necessary to construct water transmission lines to transport water to upstream users or water storage facilities would be money well spent.

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Figure 1. Map of Peace River watershed showing the main stem of river, major tributaries, and the locations of long-term USGS streamflow gages. Adapted from SWFWMD (2002).

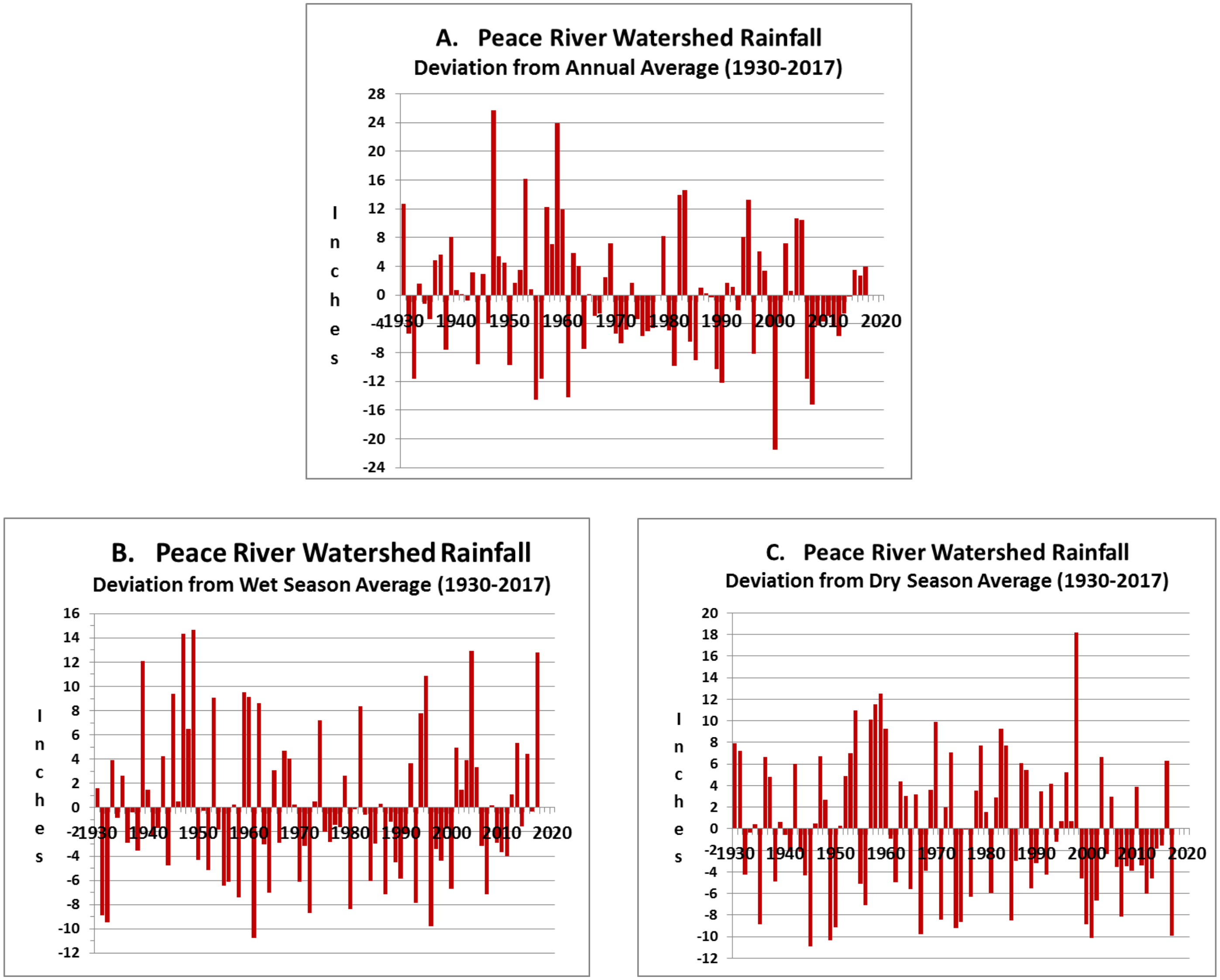


Figure 2. Yearly deviations from: (A) annual average; (B) wet season (June – September); and (C) dry season (October – May) average rainfall totals for the Peace River watershed taken from the regional rainfall summaries available from the Southwest Florida Water Management District website. Average rainfall totals for the 1930 to 2017 are annual - 52.2 inches, wet season - 31.5 inches, and dry season - 20.7 inches.

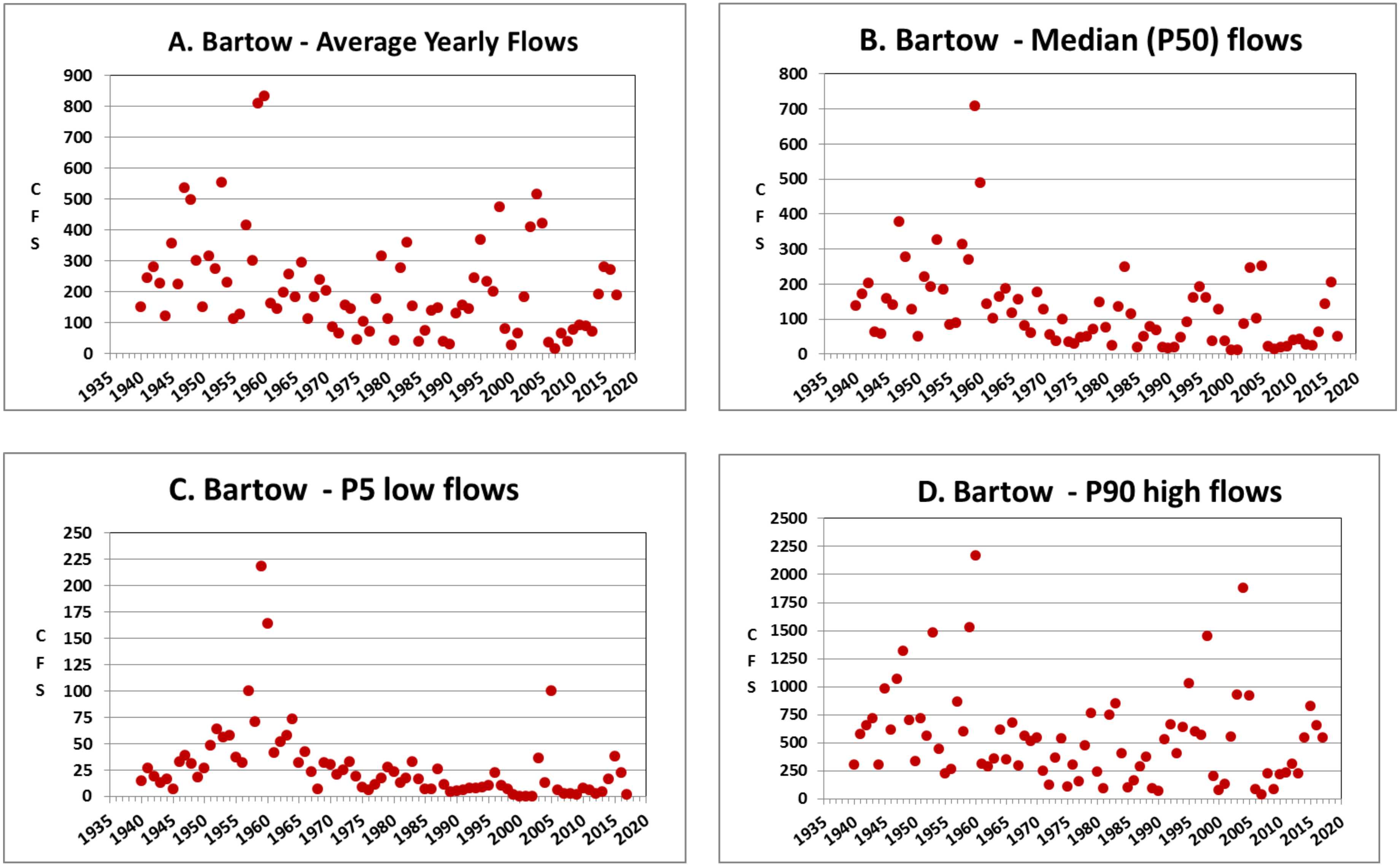


Figure 3. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Bartow gage for 1940 to 2017.

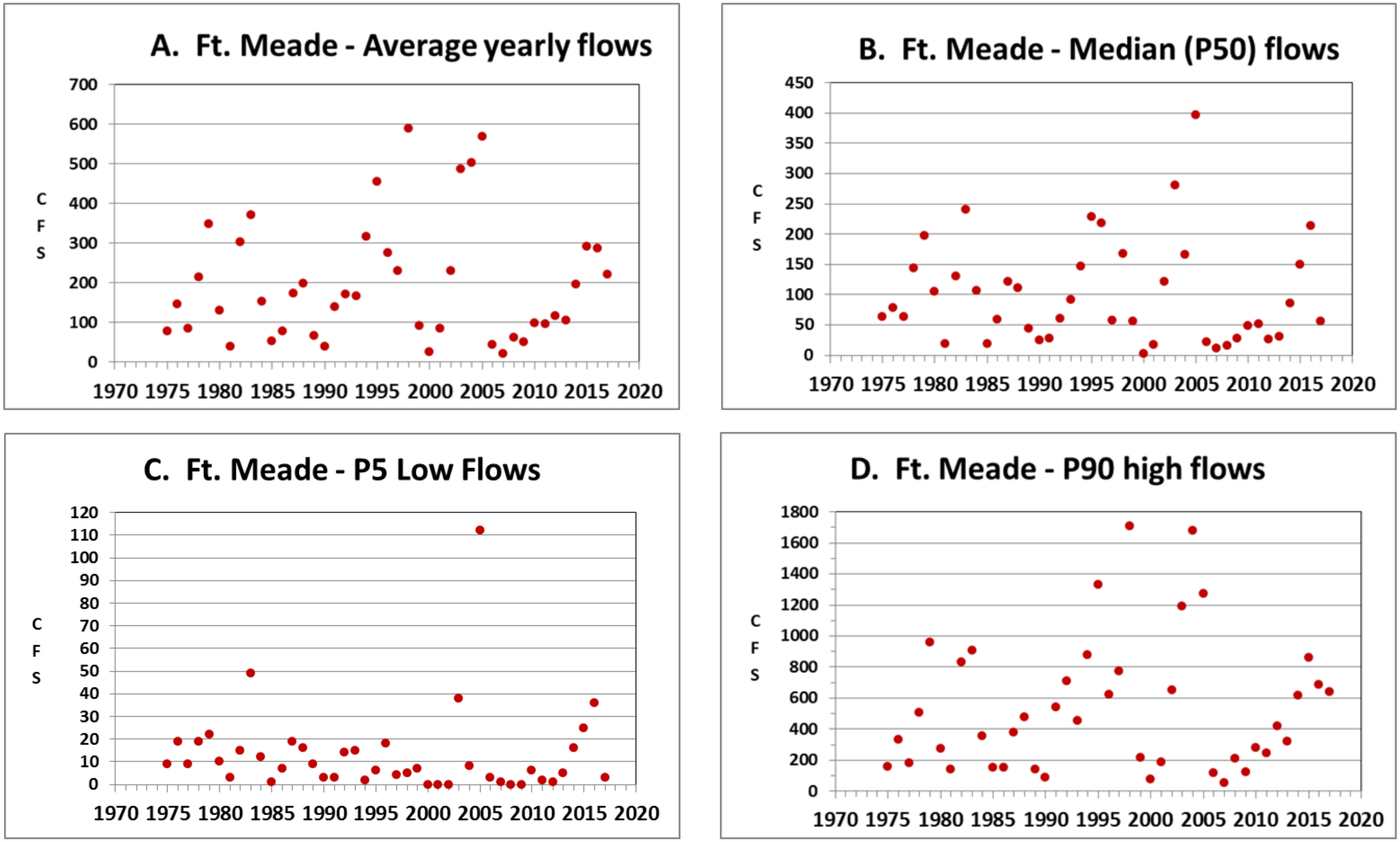
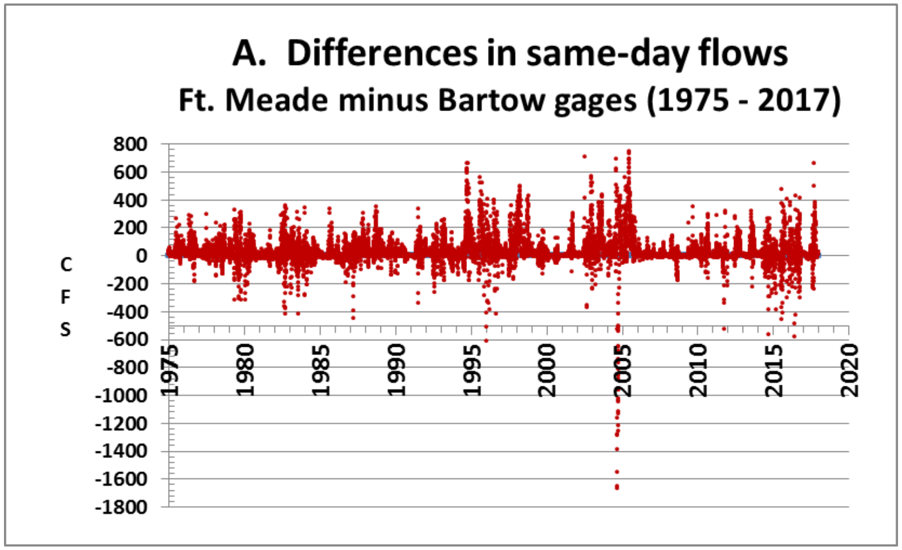


Figure 4. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Ft. Meade gage for 1975 to 2017.



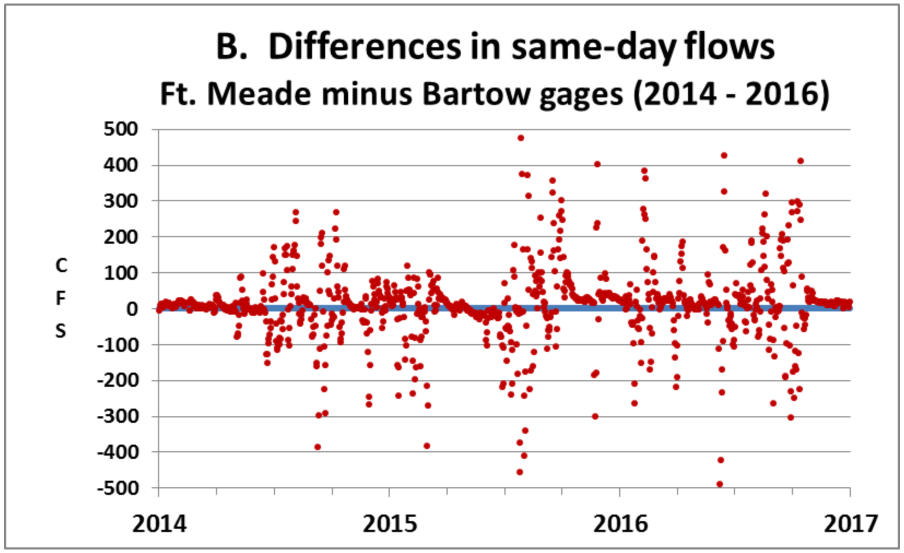


Figure 5. Hydrographs of differences in same-day flows reported by the USGS for the Peace River at Bartow and Peace River at Ft. Meade gages (Ft. Meade minus Bartow) for 1975 – 2017 and 2014 – 2016.

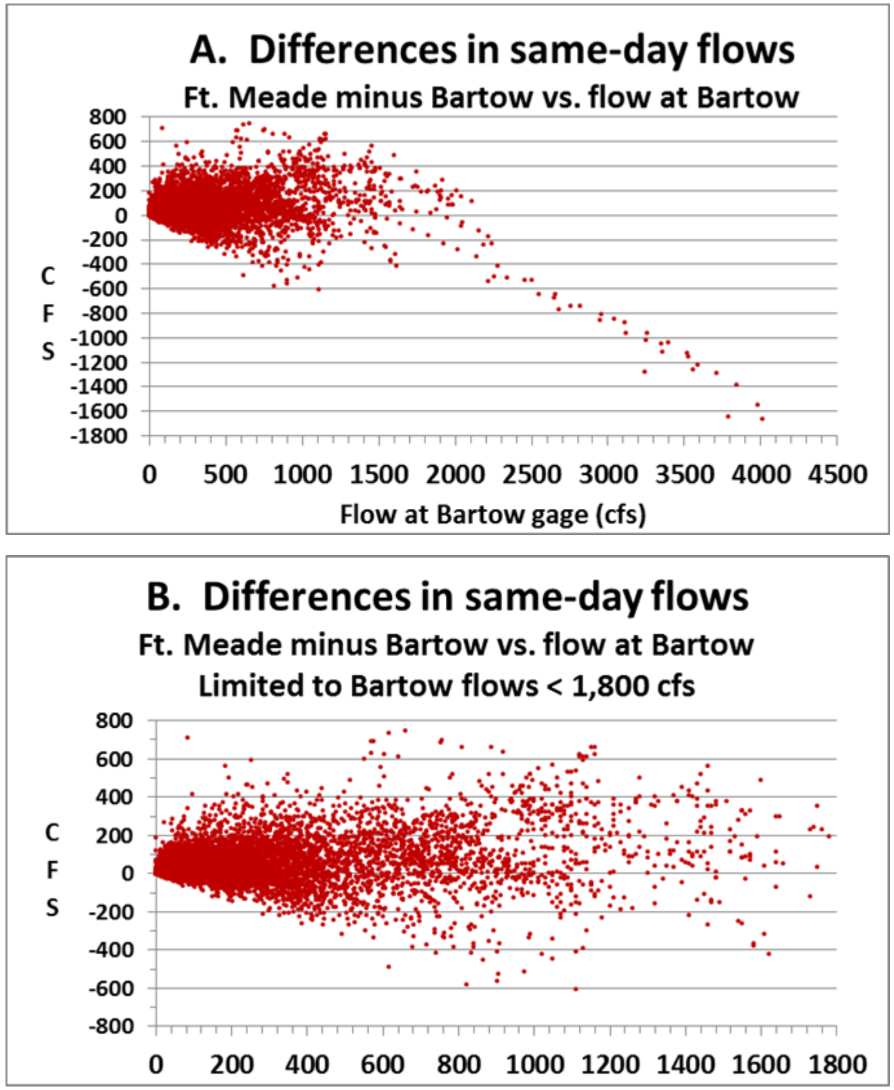


Figure 6. Hydrographs of differences in same-day flows reported by the USGS for the Peace River at Bartow and Peace River at Ft. Meade gages (Ft. Meade flow minus Bartow) versus the flow at Bartow. Hydrograph B is limited to flows at Bartow less than 1,800 cfs for better resolution. As described in the text, caution should be used in interpreting these graphs at very high flows when the river is well outside its banks.

Figure 7. Photographs of locations on the channel of the Upper Peace River between Bartow and Ft. Meade during droughts showing areas with no or very little water.

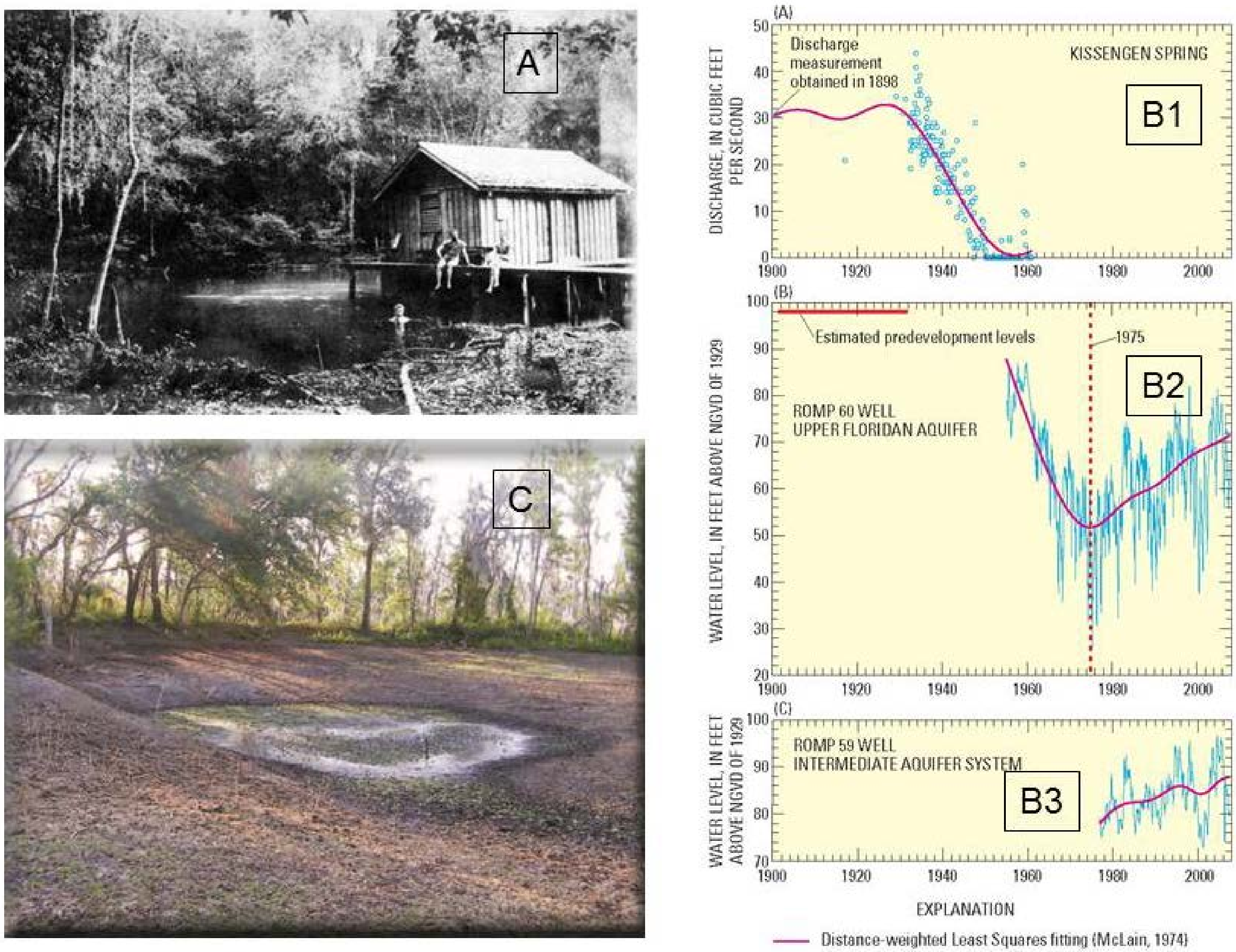


Figure 8. **A - Photograph of Kissengen Spring in 1894. B1 - Discharge from Kissengen Spring, B2- Water levels in Upper Floridan aquifer water levels at the Romp 60 well, and B3 - Water levels in the Intermediate aquifer at the Romp 50 well. C- Photograph of site of inactive Kissgengen Springs during 2006.**

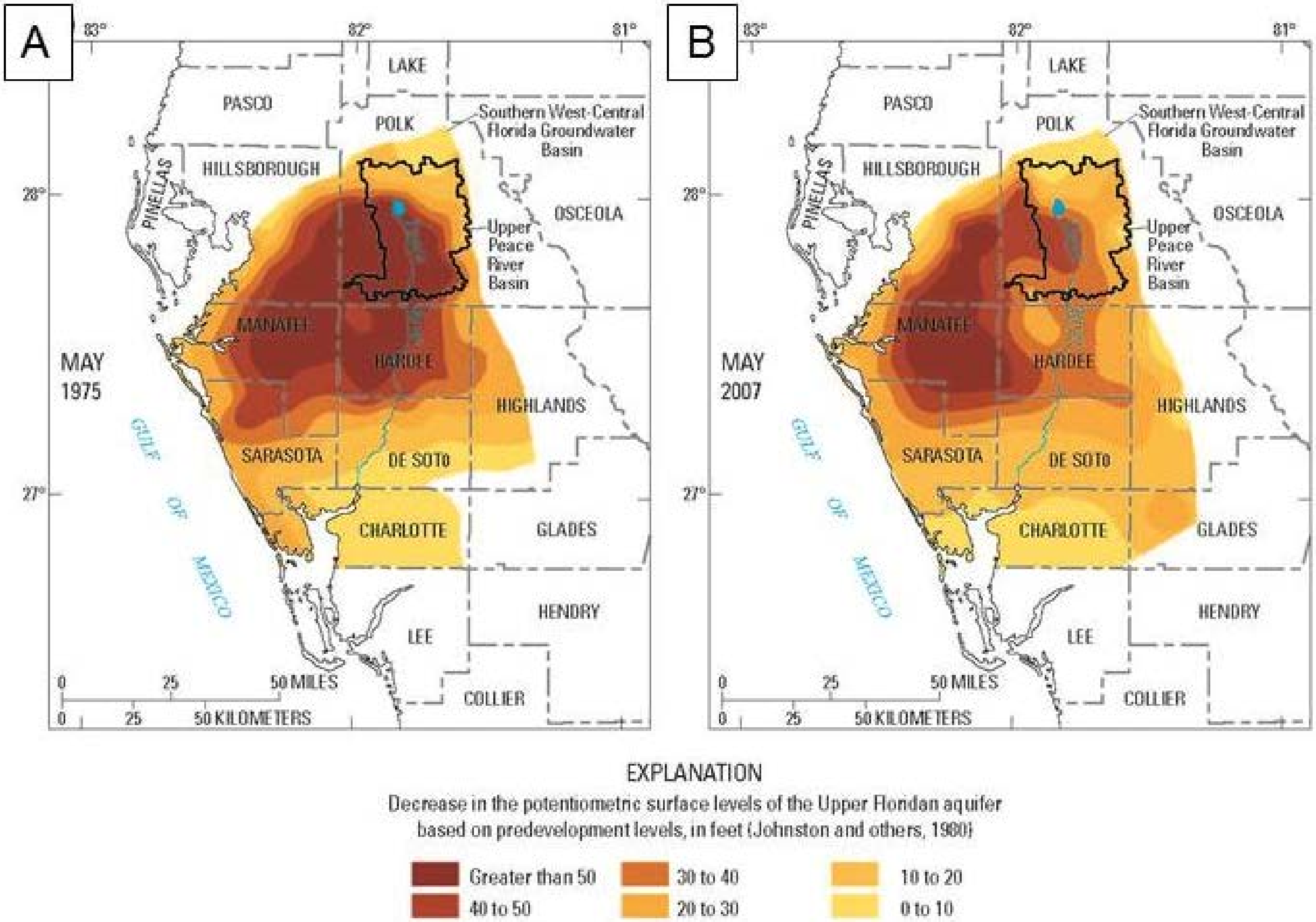


Figure 9. Changes in the potentiometric surface of the Upper Floridan aquifer in the Southern Groundwater Basin from estimated predevelopment conditions to 1975 (A) and 2007 (B). Adapted from Metz and Lewelling (2009).

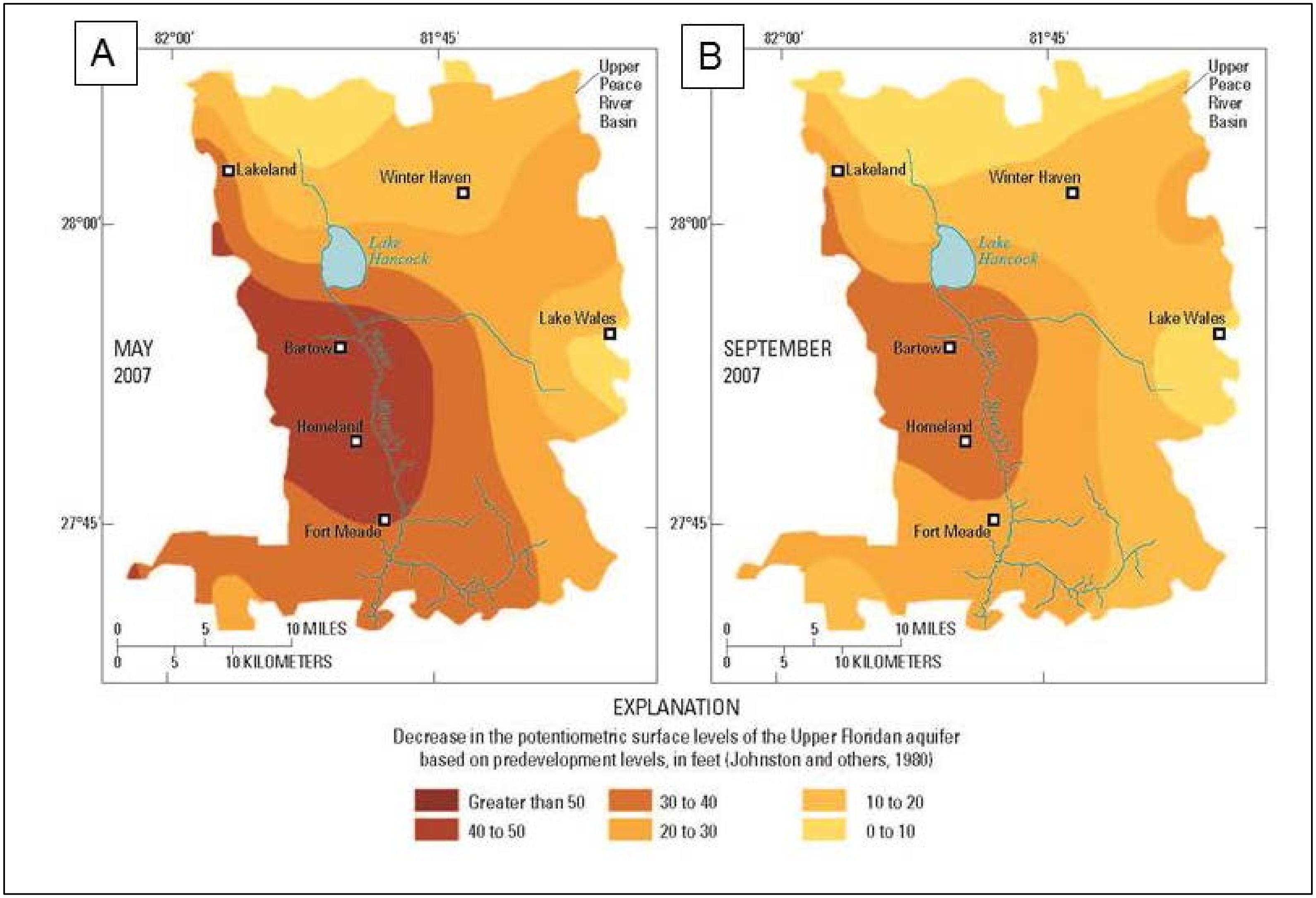


Figure 10. Changes in the potentiometric surface of the Upper Floridan aquifer in the upper Peace River basin from estimated predevelopment conditions and May 2007 (A) and September 2007 (B) levels. Adapted from Metz and Lewelling (2009).

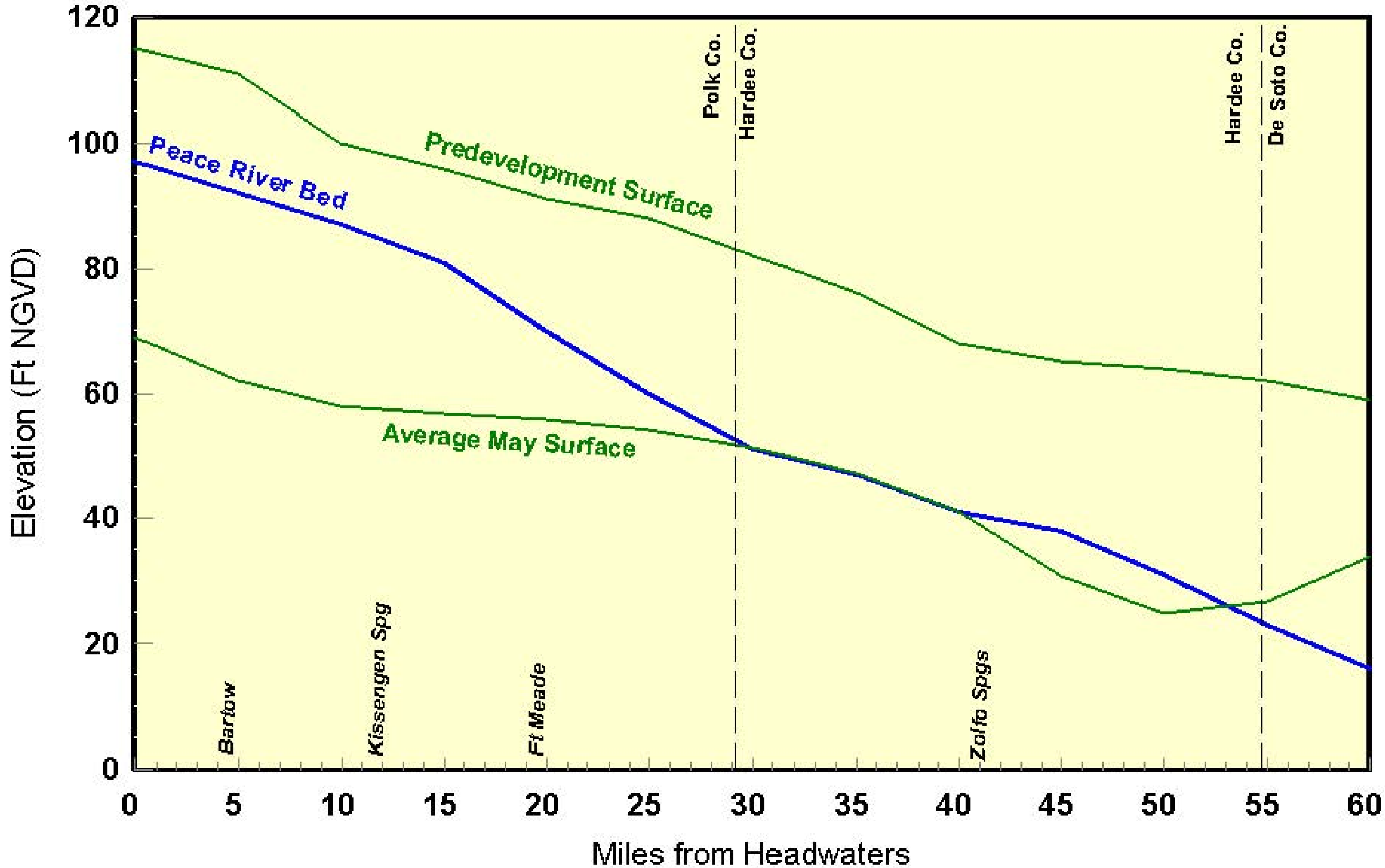


Figure 11. Generalized potentiometric surface of the Upper Floridan aquifer relative to the bed of the channel of Peace River for pre-development conditions and average May conditions for 1989-2002. Reprinted from Basso (2003).

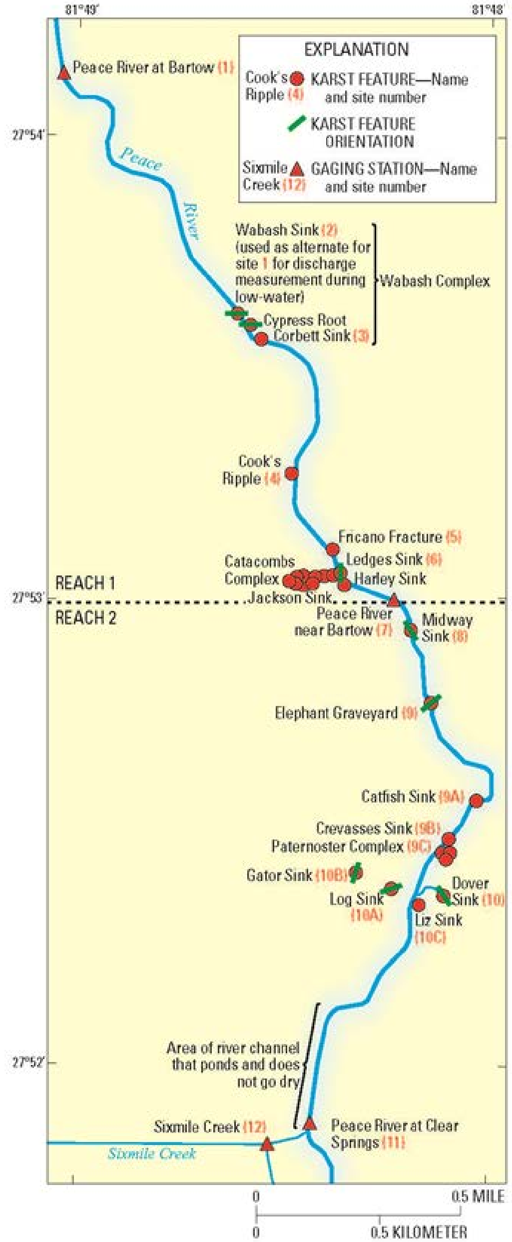


Figure 12. Location of karst features in reaches 1 and 2 of the Upper Peace River. Reprinted from Metz and Lewelling (2009).

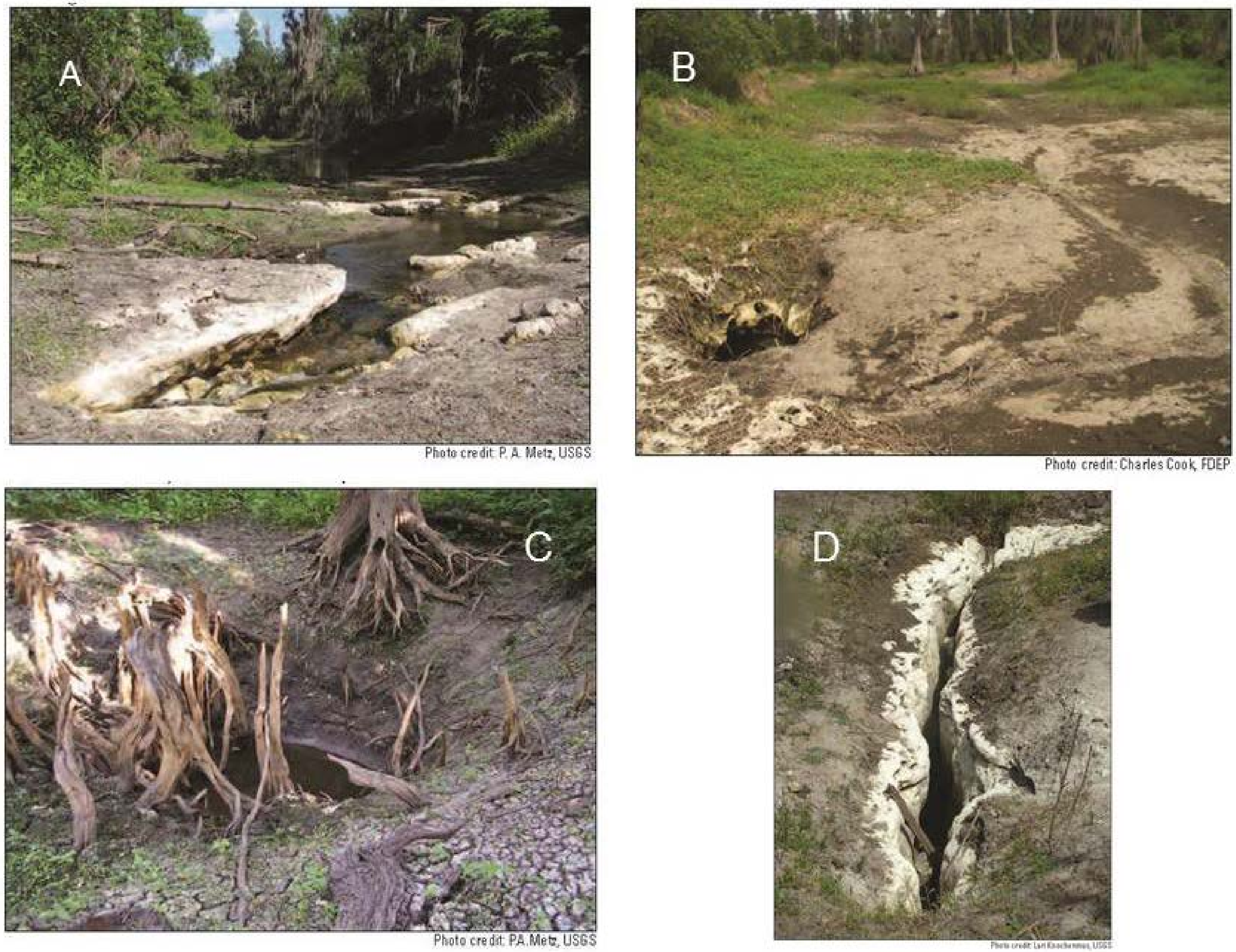


Figure 13. Photographs of sinks in the channel of the Peace River between Bartow and Ft. Meade: (A) Ledges sink; (B) Midway Sink; (C) Cavity near Wabash complex; (D) Crevasses Sink. Adapted from Metz and Lewelling (2009)

Figure 14. Photographs of sinks in the floodplain of the Peace River between Bartow and Ft. Meade: (A) Sink in eastern floodplain; (B) Gator Sink; (C) Dover Sink during dry conditions; (D) Dover Sink with ponded water during high river stage.

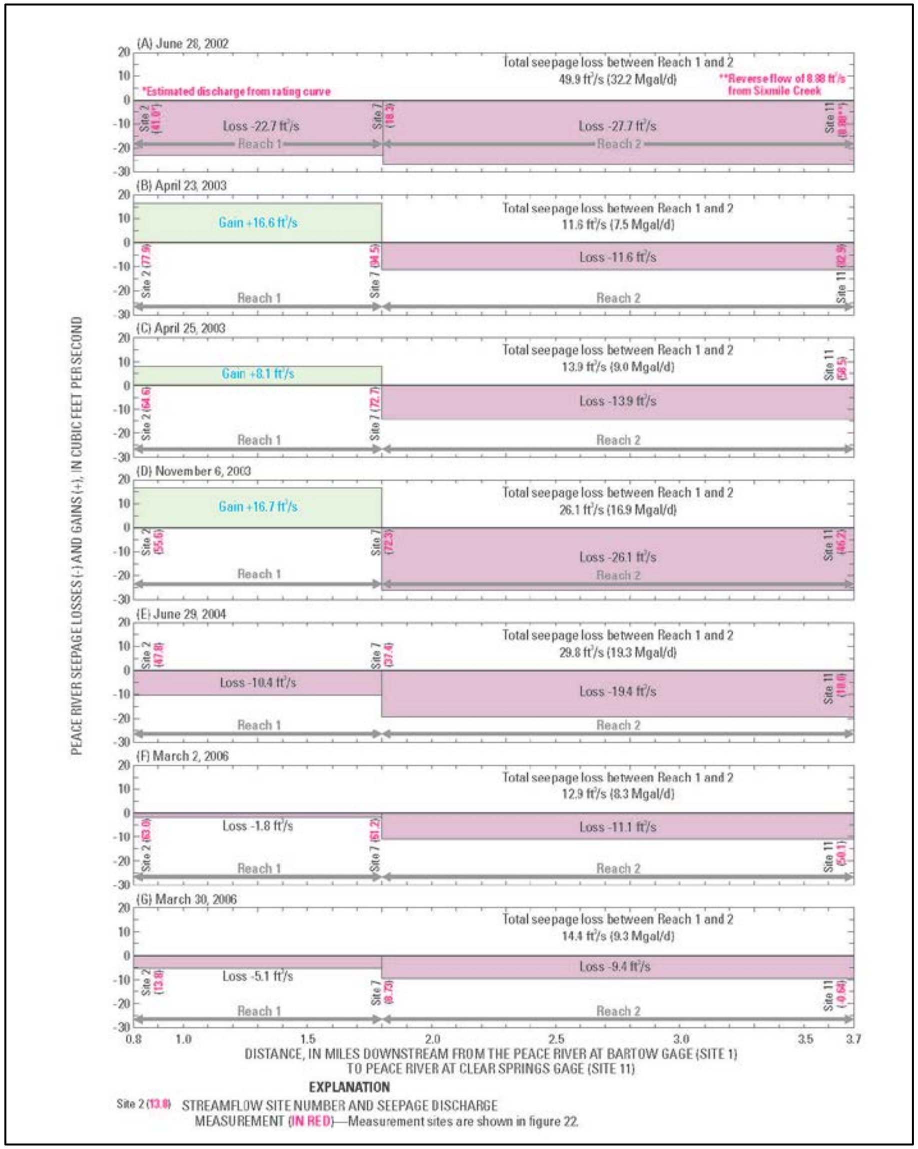


Figure 15. Streamflow gains and losses along reaches 1 and 2 from the Peace River at Wasbash (site 2) to the Peace River at Clear Springs gaging stations (site 11). Reprinted from Metz and Lewelling (2009).

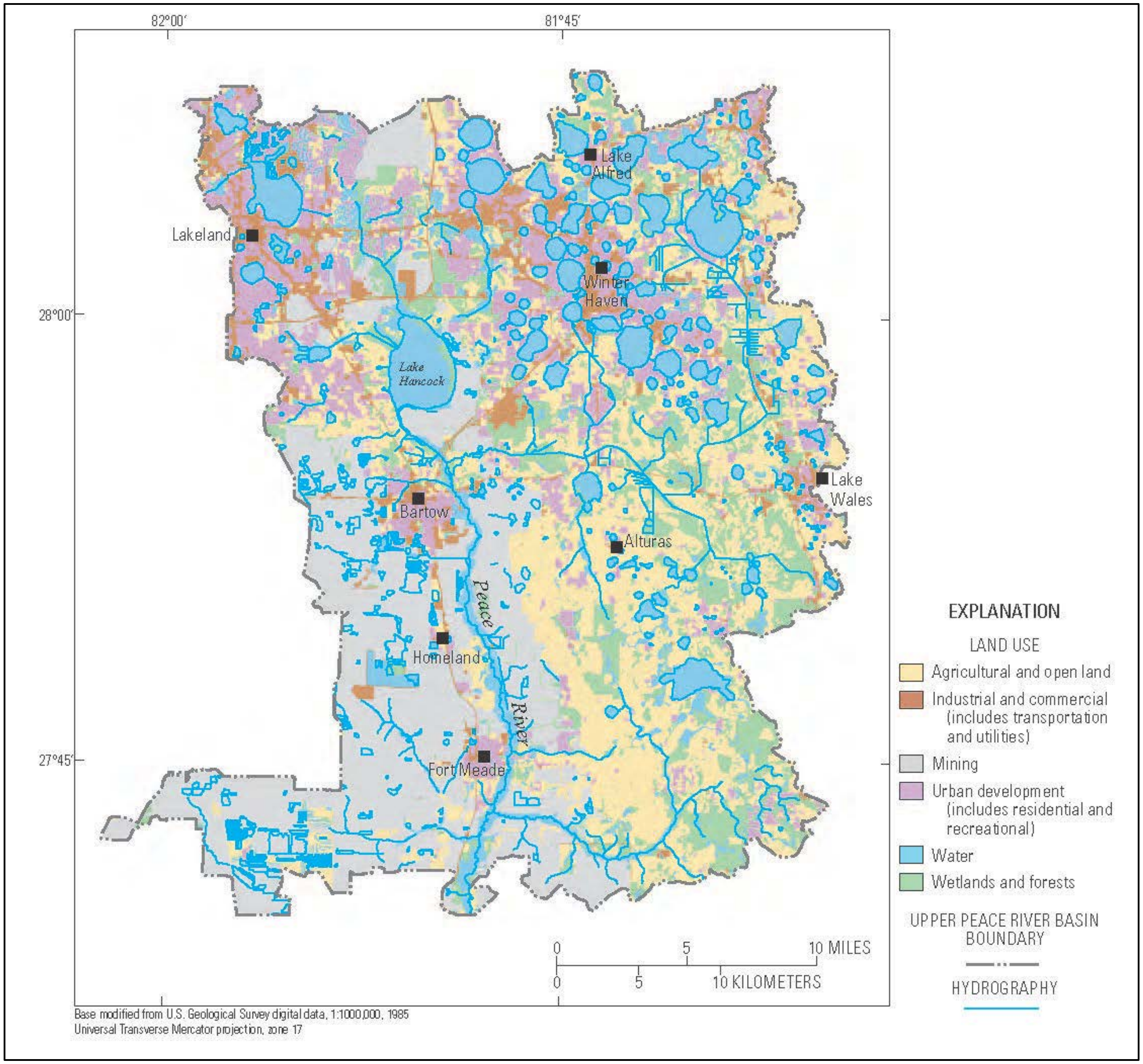


Figure 16. Major Land use categories in the Upper Peace River Basin for 2005. Reprinted from Metz and Lewelling (2009)

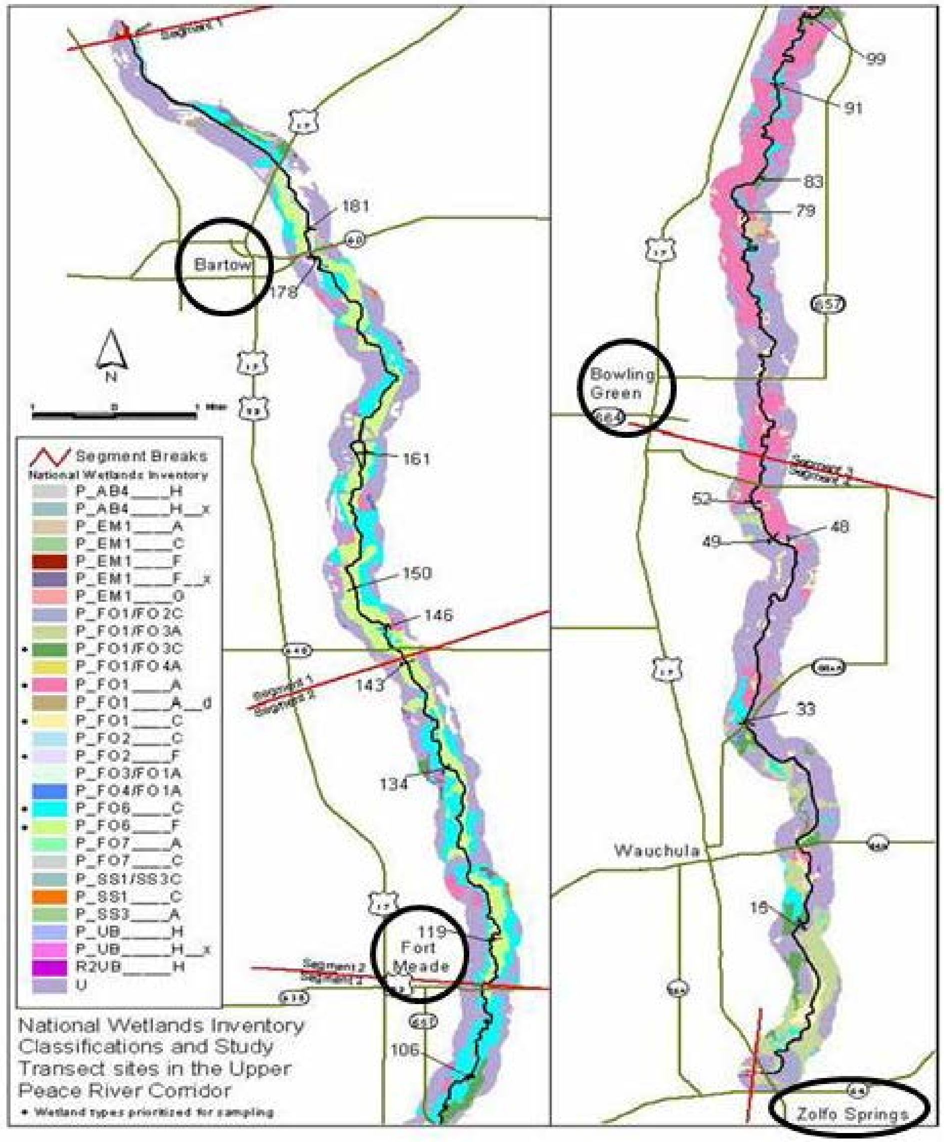


Figure 17. Distribution wetland types classified by the National Wetlands Inventory along the Upper Peace River from the origin of the Peace River above Bartow to Zolfo Springs. Towns are circled for geographic reference. Adapted from SWFWMD (2002).

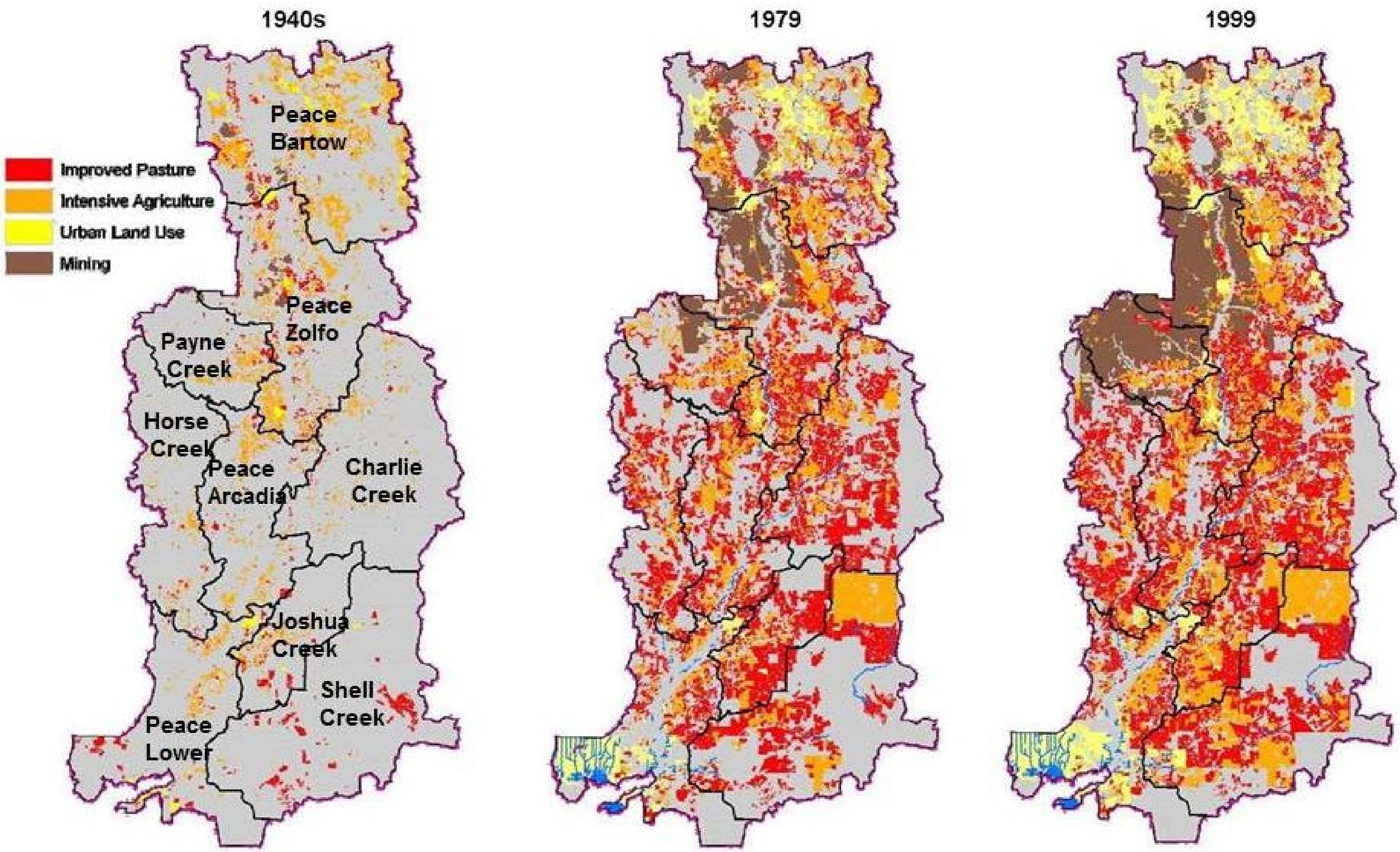


Figure 18. Distribution of major developed land uses in the Peace River watershed for the 1940s, 1979, and 1999. Major sub-basins labeled in the 1940s map for reference. Adapted from PBS&J and others (2007).

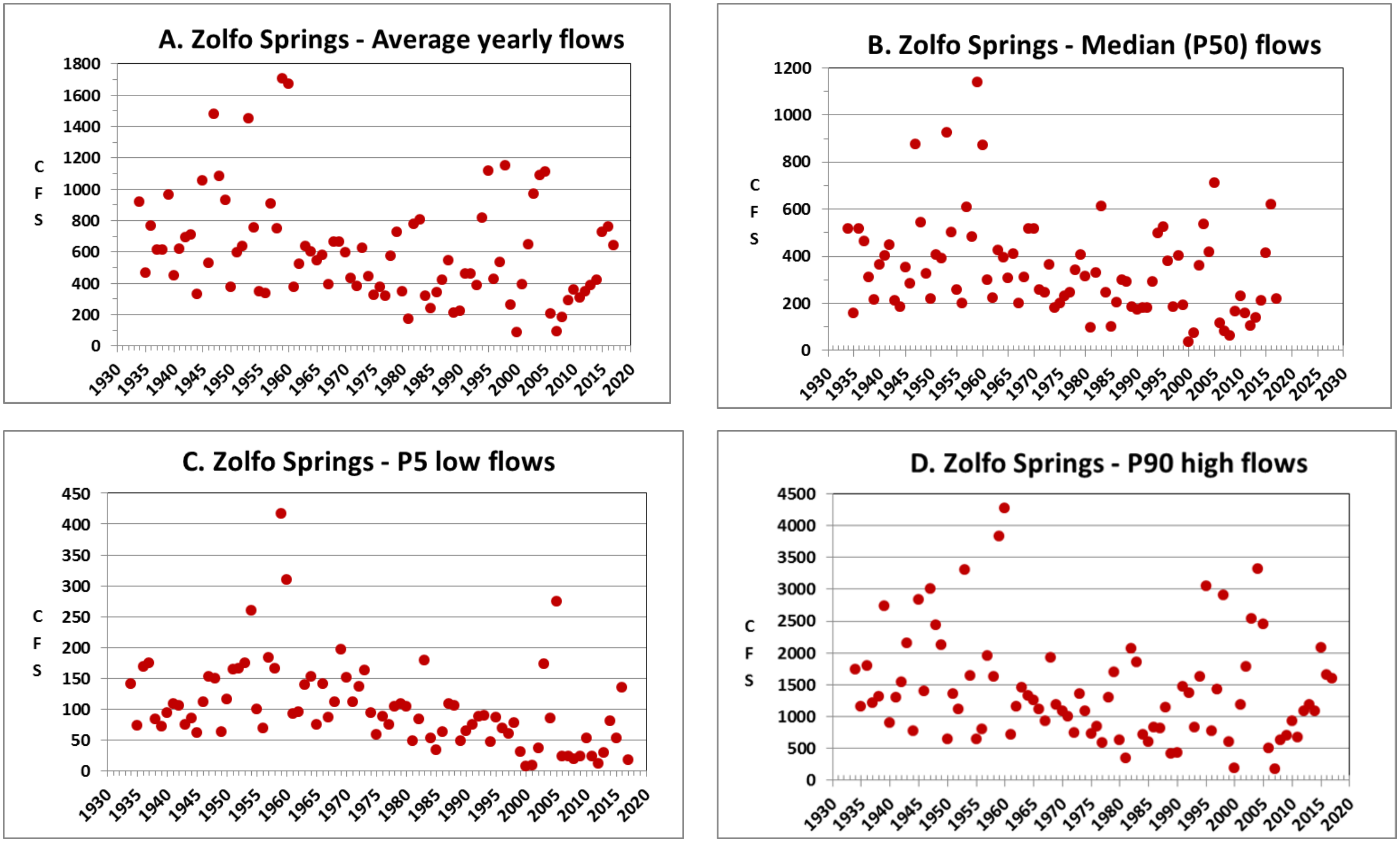


Figure 19. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Zolfo Springs gage for 1934 to 2017.

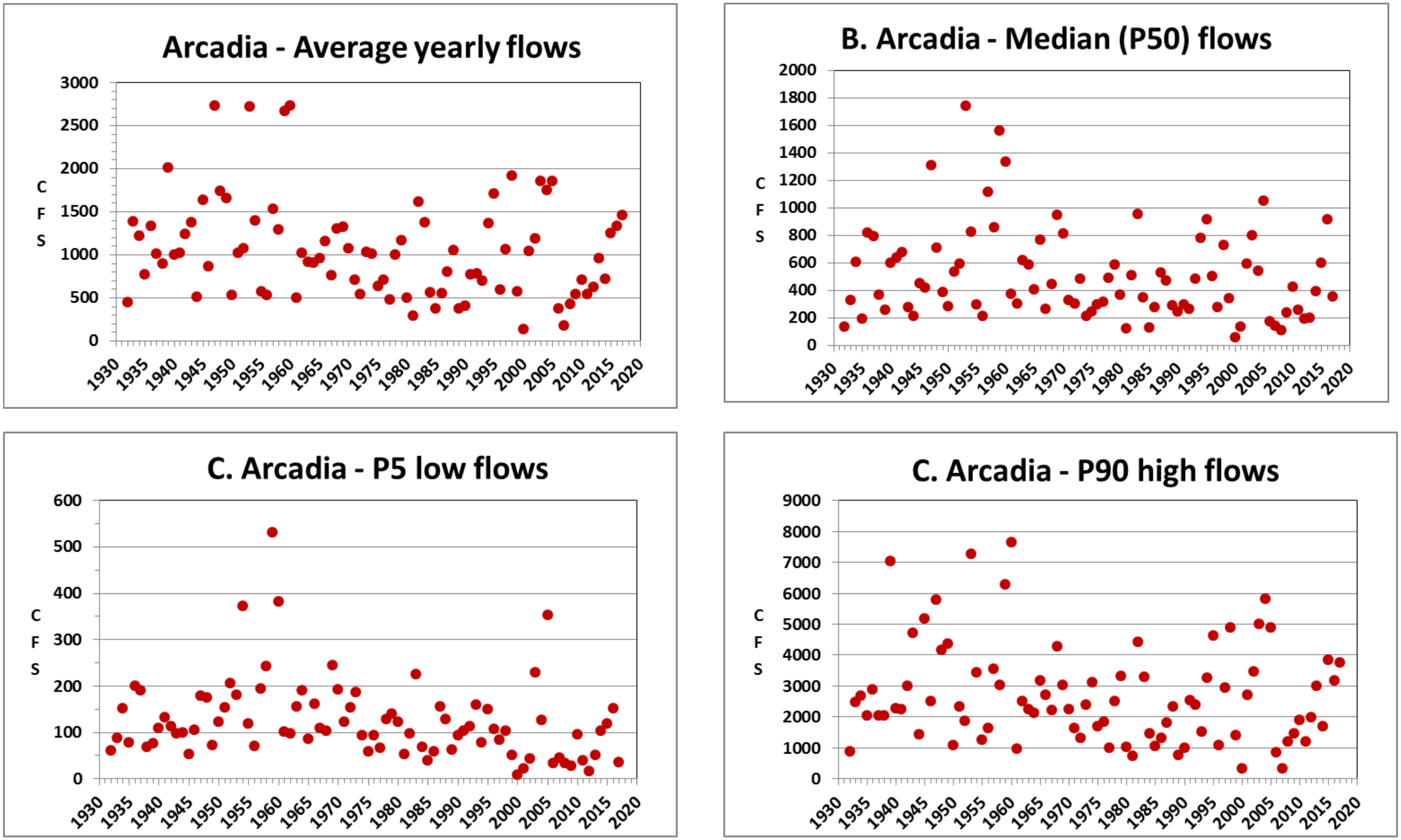


Figure 20. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Arcadia gage for 1931 to 2017.

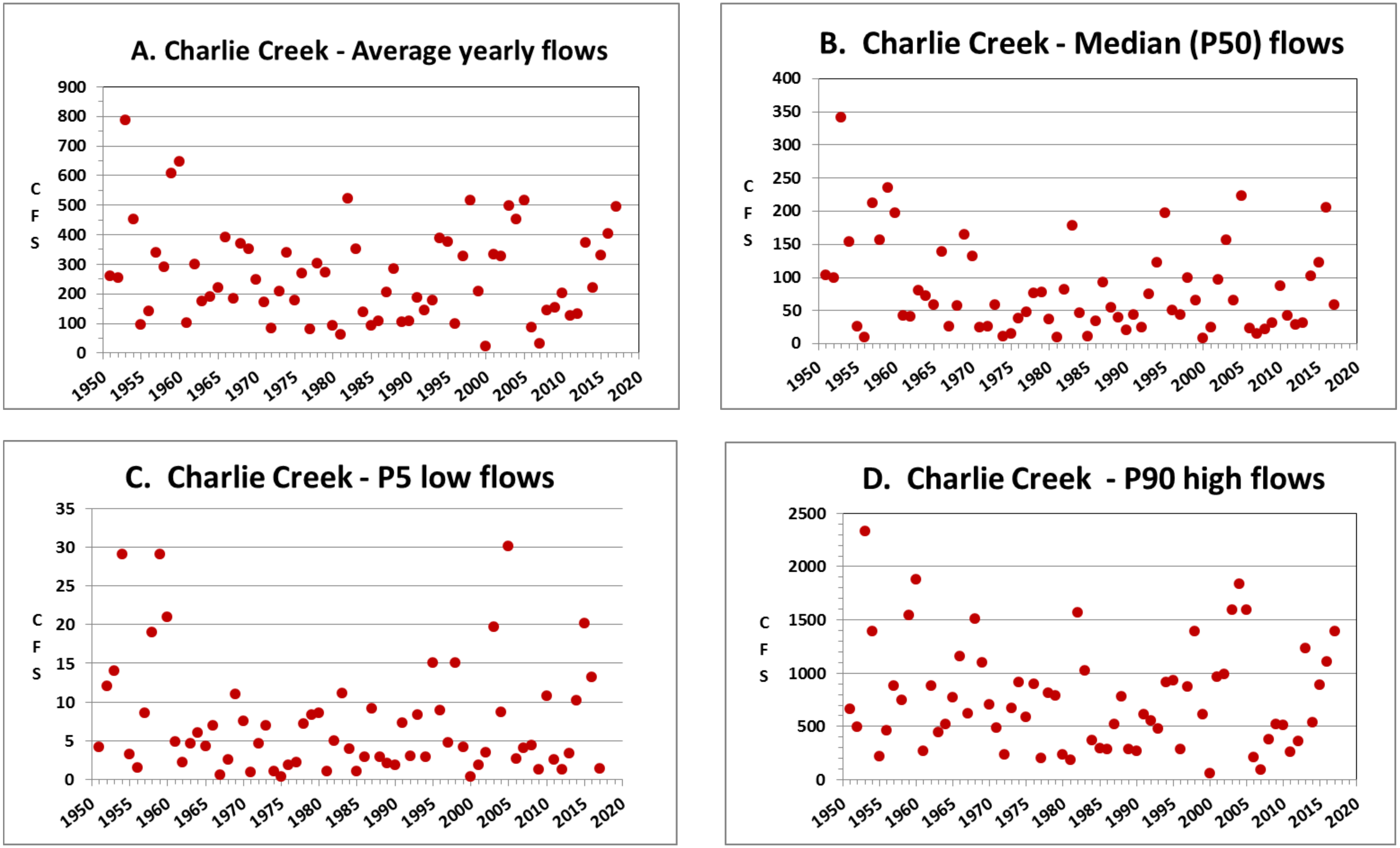


Figure 21. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Charlie Creek near Gardner for 1951 to 2017.

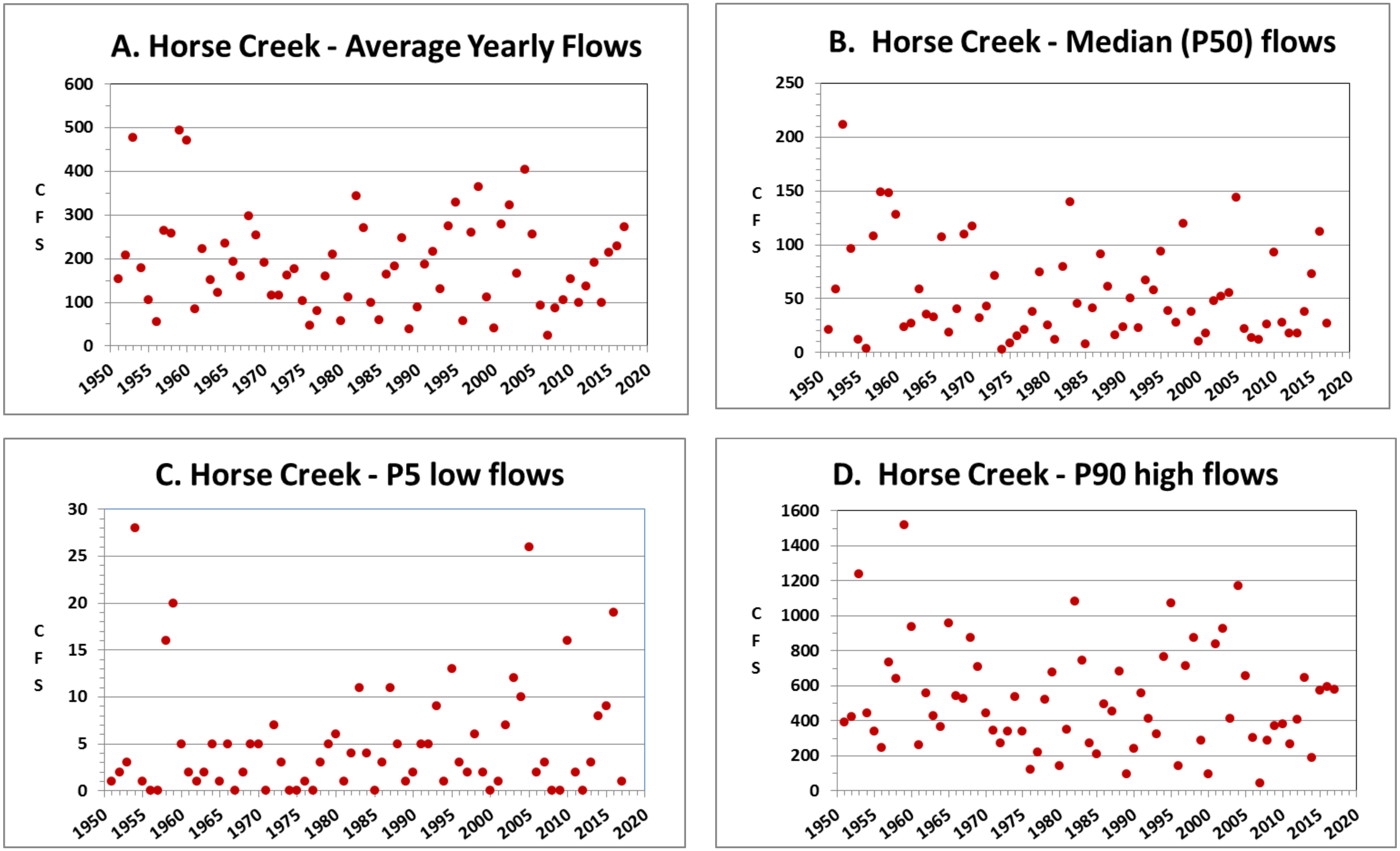


Figure 22. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Horse Creek near Arcadia for 1951 to 2017.

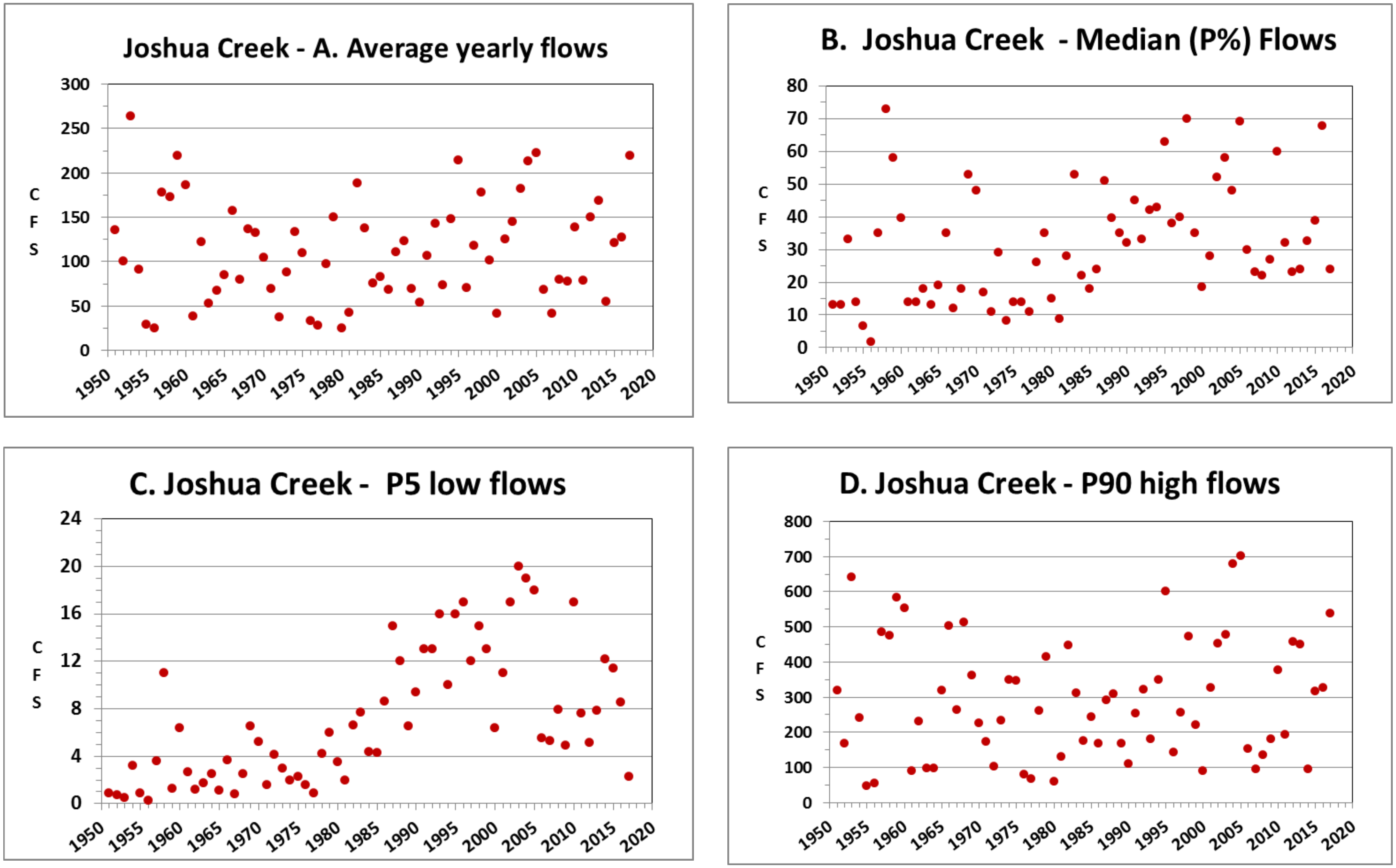


Figure 23. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Joshua Creek at Nocatee for 1951 to 2017.

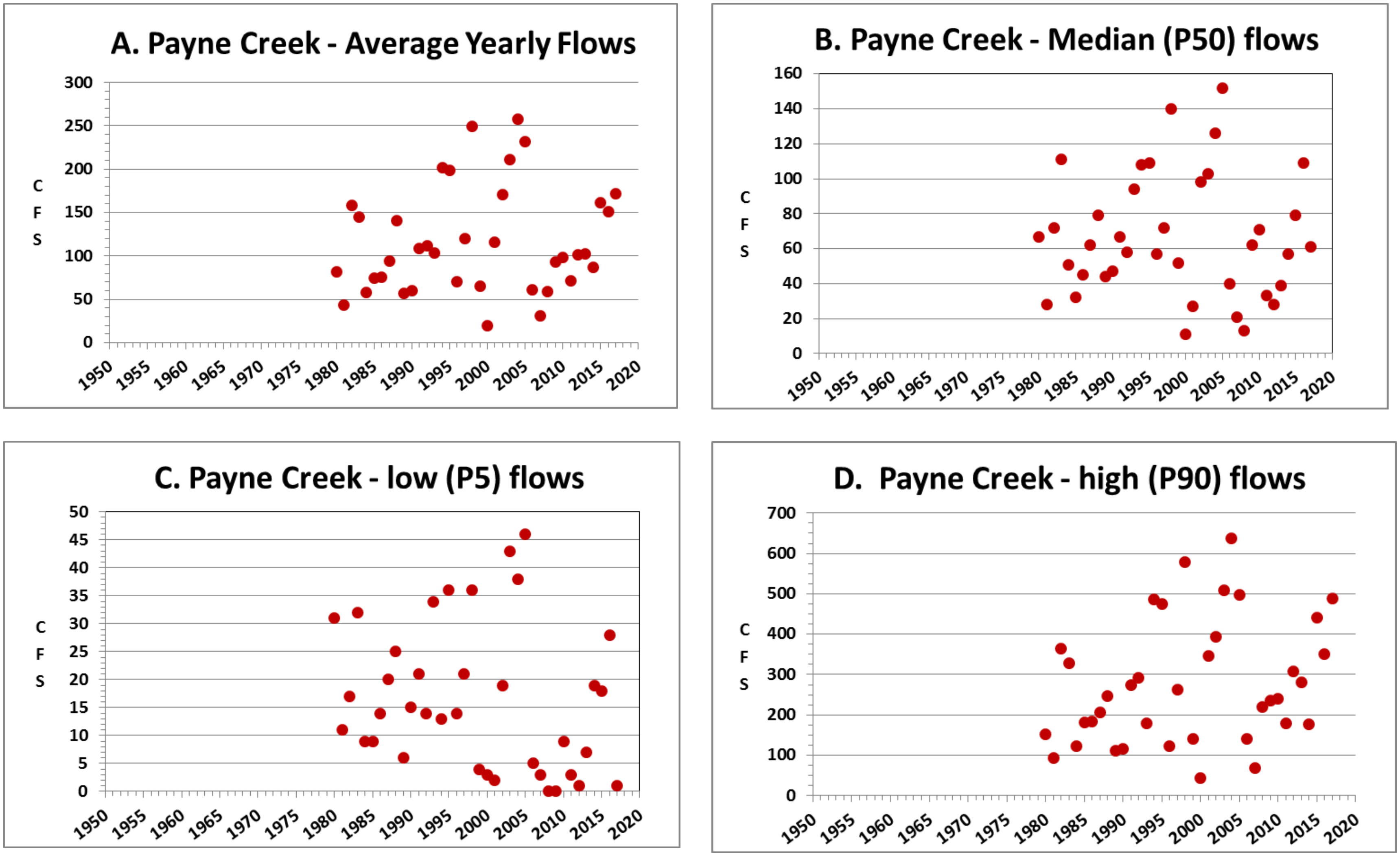


Figure 24. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Payne Creek near Bowling Green for 1980 to 2017.

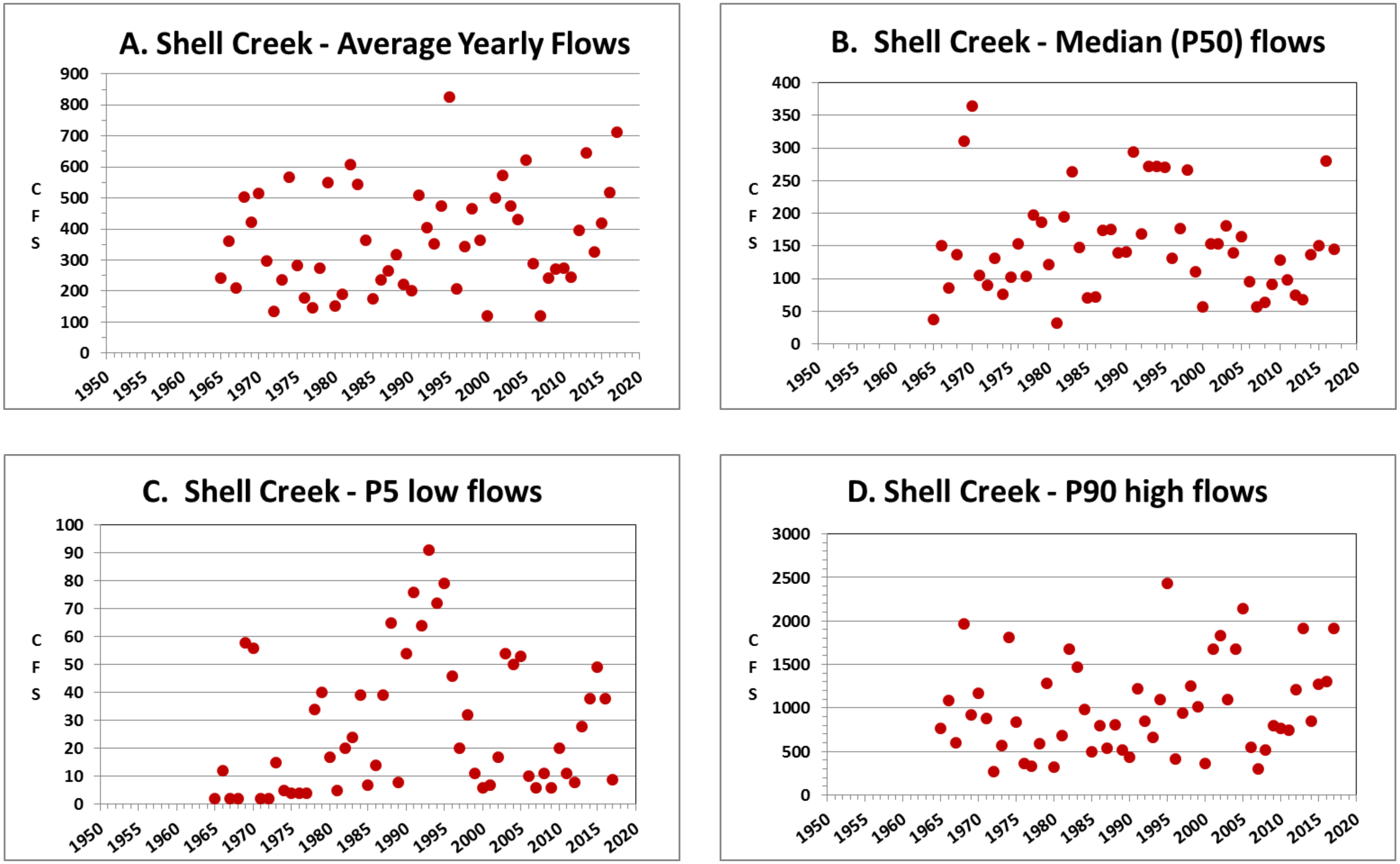


Figure 25. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Shell Creek near Punta Gorda for 1965 to 2017.

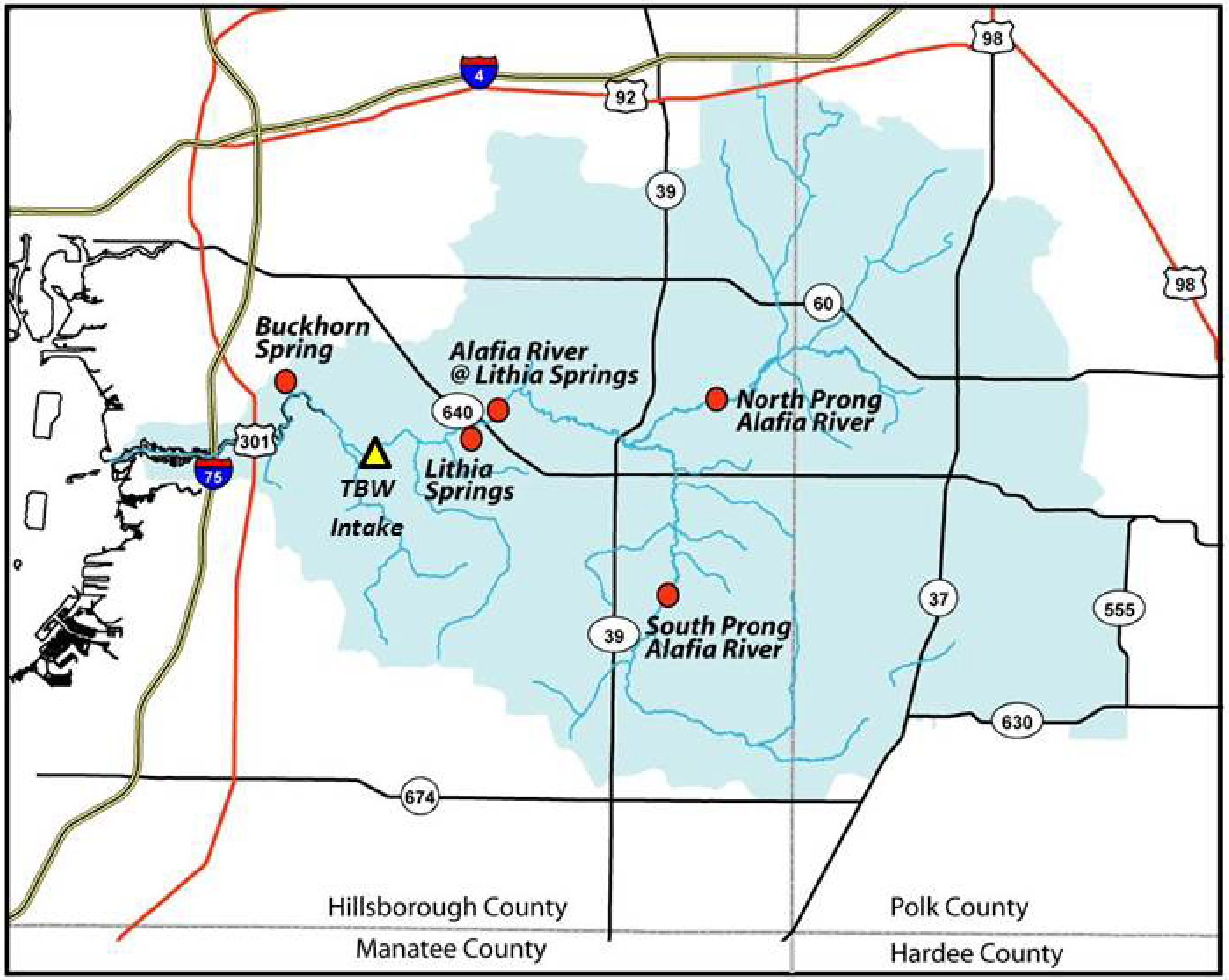
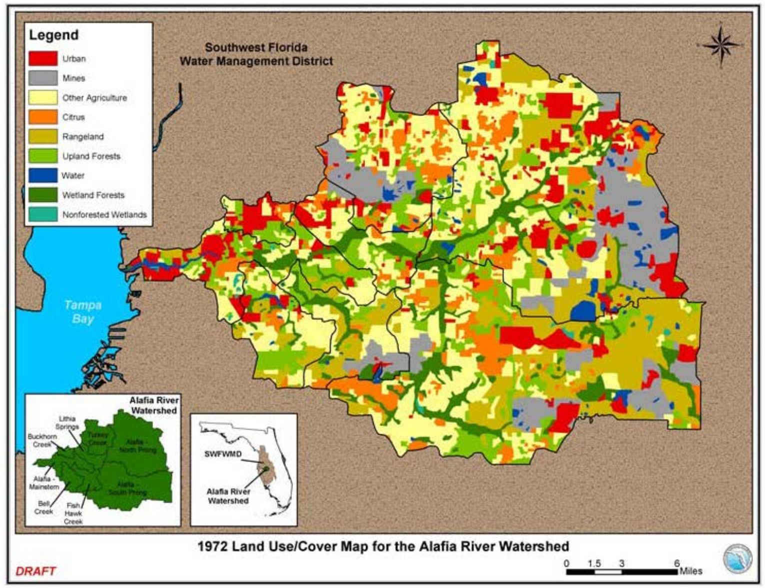


Figure 26. The Alafia River watershed showing the channels of the river and north and south prongs with the location of USGS gages on the Alafia River at Lithia, the North Prong near Keysville, and the South Prong near Lithia. Also shown is the location of Lithia and Buckhorn Springs and the intake site for Tampa Bay Water (yellow triangle). Adapted from SWFWMD (2005).



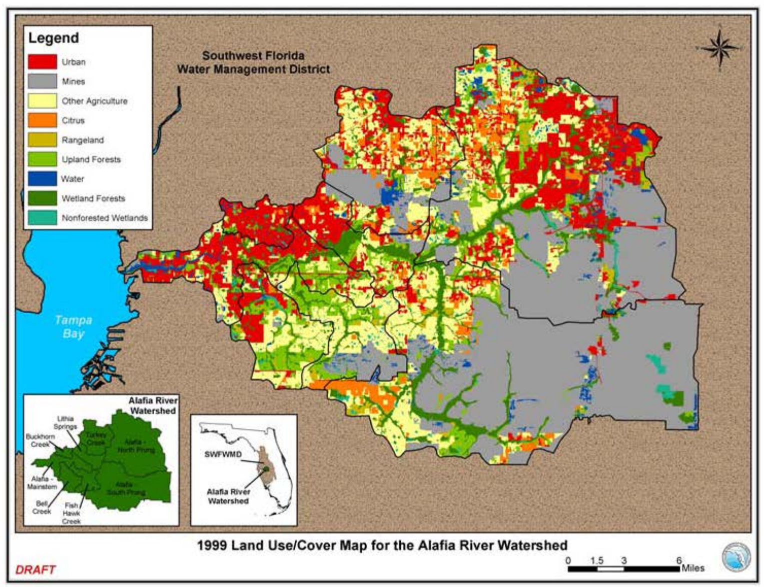


Figure 27. Major land use categories in the Alafia River watershed for 1972 (top) and 1999 (bottom). Reprinted from SWFWMD (2005).

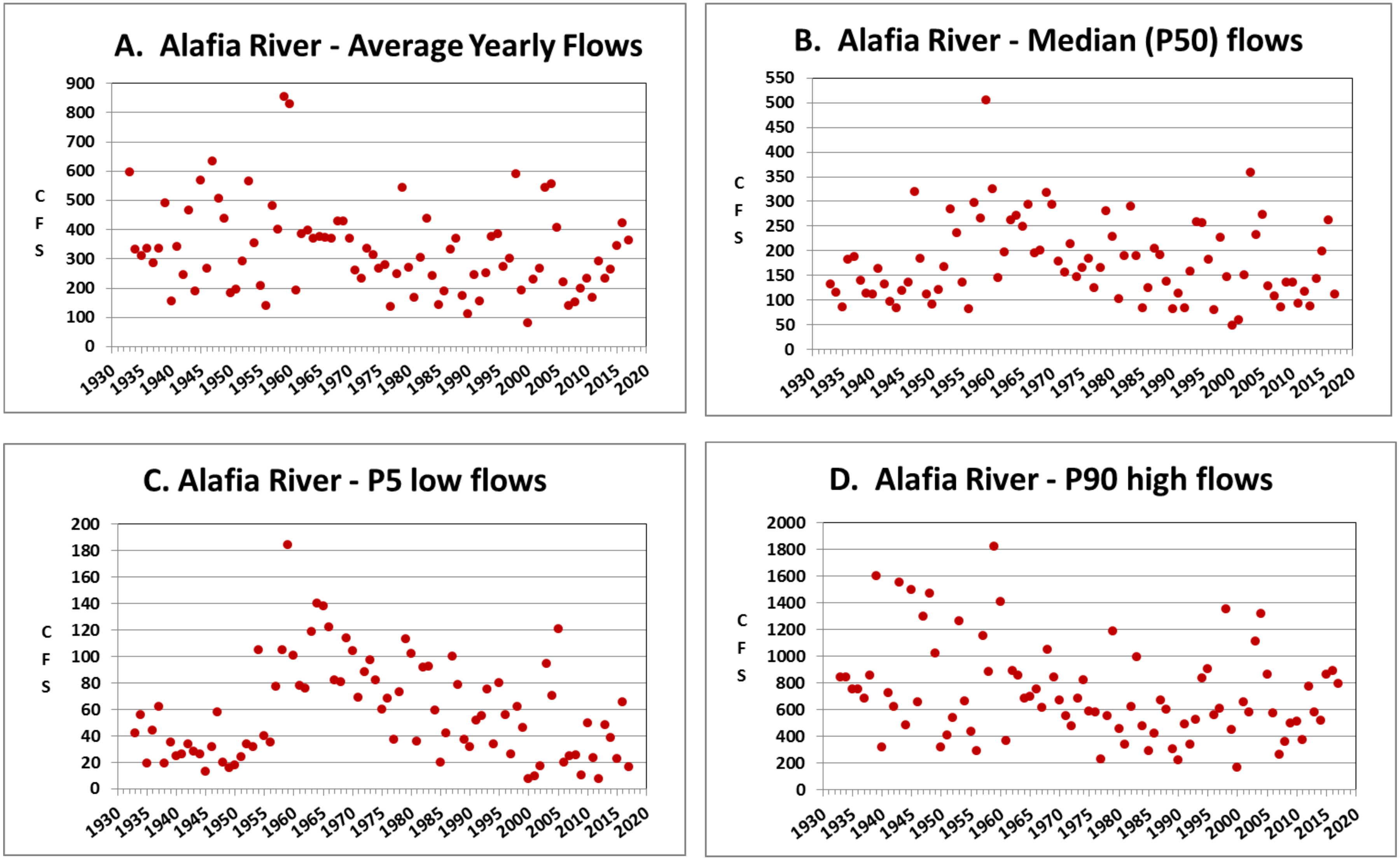


Figure 28. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Alafia River at Lithia for 1933 to 2017.

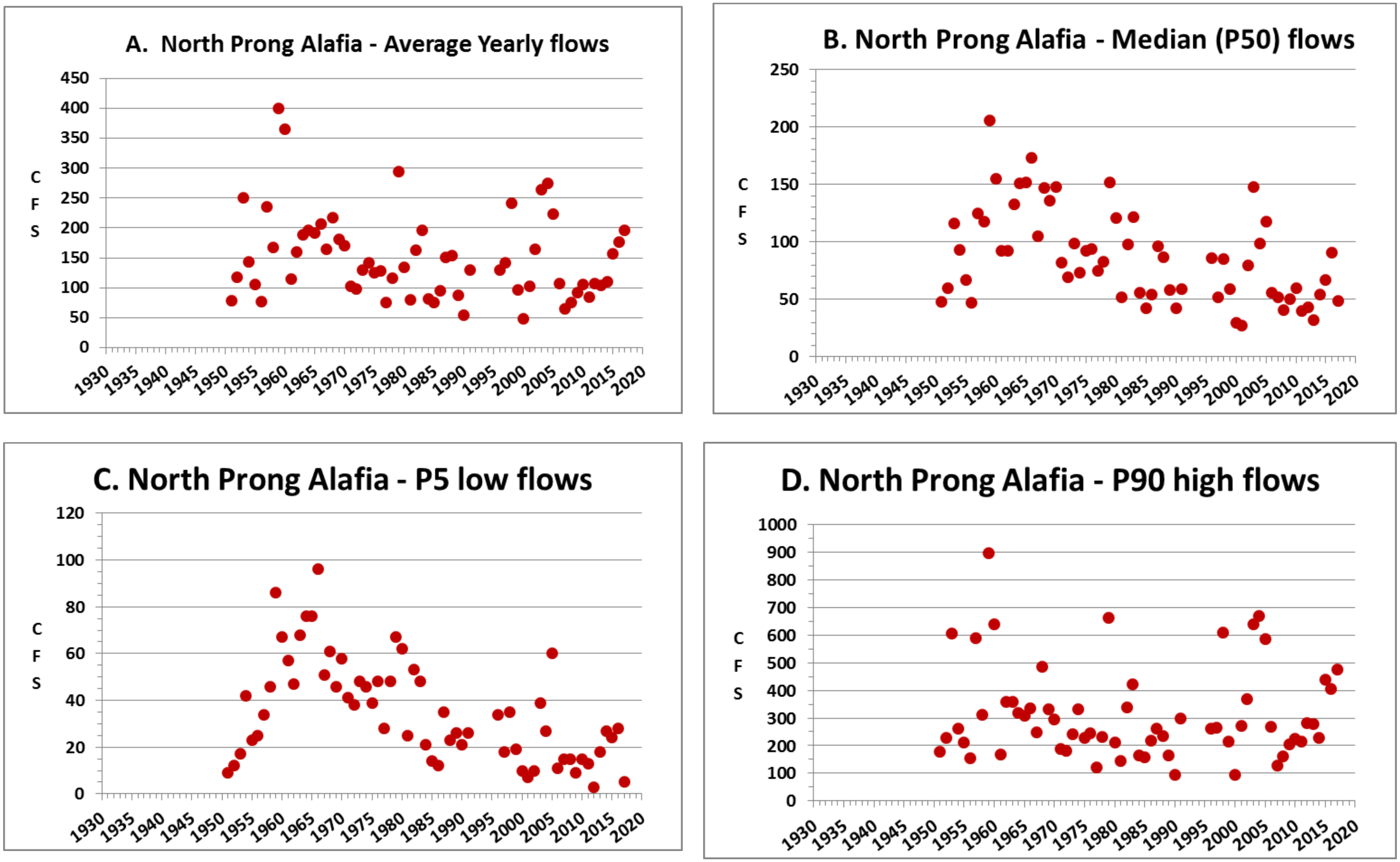


Figure 29. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the North Prong of the Alafia River at Lithia for 1951 to 2017. No values shown for 1992 - 1995 due to lack of complete daily data within those years.

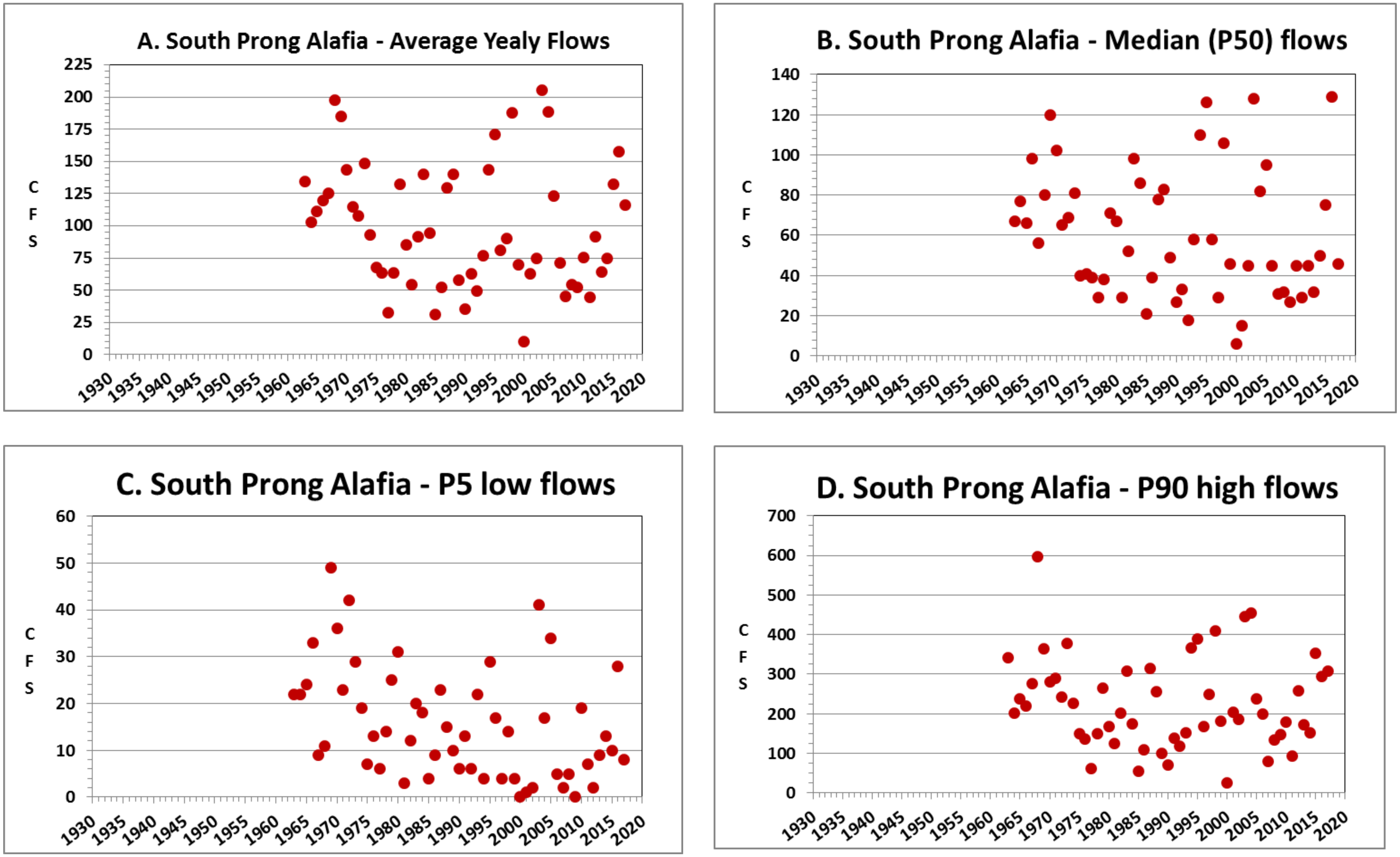


Figure 30. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the South Prong of the Alafia River near Lithia for 1951 to 2017.

Figure 31. The North Prong of the Alafia River approximately one mile above the confluence with the South Prong.

Appendix A

Summary informatipon for additional flow gages on the Peace River or tributaries to the river not listed in Table 1.
Only the most downstream gage on each tributary is listed.

	Gage Number	Drainage Area (mi2)	Beginning month and year of flow data
Polk County			
Peace Creek Drainage Canal nr. Wahneta	2293987	162	April - 1991
Peace Creek nr. Bartow	2294161	205	January - 2006
Saddle Creek at St. Hwy 542 nr. Lakeland*	2294217	53	August - 1996
Saddle Creek at St. Hwy 570 nr, Eaton	2294290	61	February - 2009
Peace River nr. Bartow	2294655	395	May - 2002
Sixmile Creek at Bartow	2294747	not listed	December- 2002
Phosphate Mine Outfall CS-8 nr. Bartow	2294759	not listed	February - 2003
Barber Branch nr. Homeland	2294760		October - 2006
Peace River at Clear Springs nr. Bartow	2294775	396	June - 2002
Peace River nr. Homelad	2294781	411	October - 2001
Bowlegs Creek nr. Ft. Meade	2295013	47.2	February - 1991
Whidden Creek nr. Ft. Meade***	2295163	43	November - 2000
Hadee County			
Peace River at Bowling Green	2295184	613	December - 2010
Payne Creek nr. Bowling Green	2295420	121	October - 1986
Little Charlie Creek nr. Mouth nr. Wachula*	2295580	not listed	October - 2012
Charlie Creek nr. Gardner	2296500	330	October - 1991
DeSoto County			
Horse Creek nr. Arcadia	2297310	218	April - 1950
Joshua Creek at Nocatee	2297100	132	April - 1950
Charlotte County			
Shell Creek nr. Punta Gorda	2298202	371	January - 1950

Appendix B
Minimum Flows for the upper Peace River

CHAPTER 40D-8
WATER LEVELS AND RATES OF FLOW

(7) Minimum Flows for upper Peace River.

(a) Over the last several decades there has been a significant decline in flow in the upper Peace River, especially during the dry season. One of the major contributing factors is the elimination of baseflow as a result of ground water withdrawals that have lowered the potentiometric surface of the upper Floridan aquifer. In addition, surface-water drainage alterations, reduction in surface storage, long-term cyclical declines in rainfall and karst openings in the riverbed have played significant roles in reducing flow in the upper Peace River.

(b) The minimum flows are to ensure that the minimum hydrologic requirements of fish and natural systems associated with the river are met and not jeopardized by withdrawals. At this time only Minimum Low Flows are being established. It is anticipated that mid- and high-minimum flows will be established once the controlling factors that affect those flows are better understood.

(c) The Minimum Low Flows for the upper Peace River are set forth in Table 8-8 below. The Minimum Low Flows are established based on the lowest acceptable flow under the lowest anticipated flow conditions. This is determined by providing for the hydrologic requirements of biological communities associated with the upper Peace River system, as well as considering non-consumptive uses including fishing, wildlife observation, general recreation, aesthetic enjoyment, canoeing and boating. This determination uses professional experience and judgment to identify key habitats and hydrologic requirements for specific biotic assemblages. This approach results in establishing Minimum Low Flows for the upper Peace River based on maintaining the higher of the water elevations needed for fish passage (0.6 feet or 7.2 inches) or the lowest wetted perimeter inflection point (as much stream bed coverage as possible for the least amount of flow) as set forth below. A ninety-five percent annual exceedance occurs when the flow is greater than the Minimum Low Flow at least ninety-five percent of the days, or 350 days, of a calendar year.

Table 8-8 Minimum Flows for the upper Peace River	
Location/Gage	Minimum Flow (cubic feet per second)
Bartow / USGS Bartow River Gage No. 02294650	Annual 95% exceedance flow of 17 cfs
Ft. Meade / USGS Ft. Meade River Gage No. 02294898	Annual 95% exceedance flow of 27 cfs
Zolfo Springs / USGS Zolfo Springs River Gage No. 02295637	Annual 95% exceedance flow of 45 cfs

(d) Compliance – The Minimum Low Flow is achieved when the measured flow rate is at or above the Minimum Low Flow for three consecutive years. Once the Minimum Low Flow has been achieved for three consecutive years, the Minimum Low Flow is not met when the measured flow rate is below the Minimum Low Flow for two out of ten years commencing the year after achievement. If the two years below the minimum flow occur anytime before the ten year period is complete, the upper Peace River is deemed below its Minimum Low Flow and the three consecutive years above the Minimum Low Flow is again required for compliance. Once the ten-year period is complete, the period will roll forward one year each year.

DRAFT September 24, 2018

Figures for

A Watershed Based Approach for Assessing Potential New Surface Water Withdrawal Sites from the Peace and Alafia Rivers

Figures also included with the text in a separate file

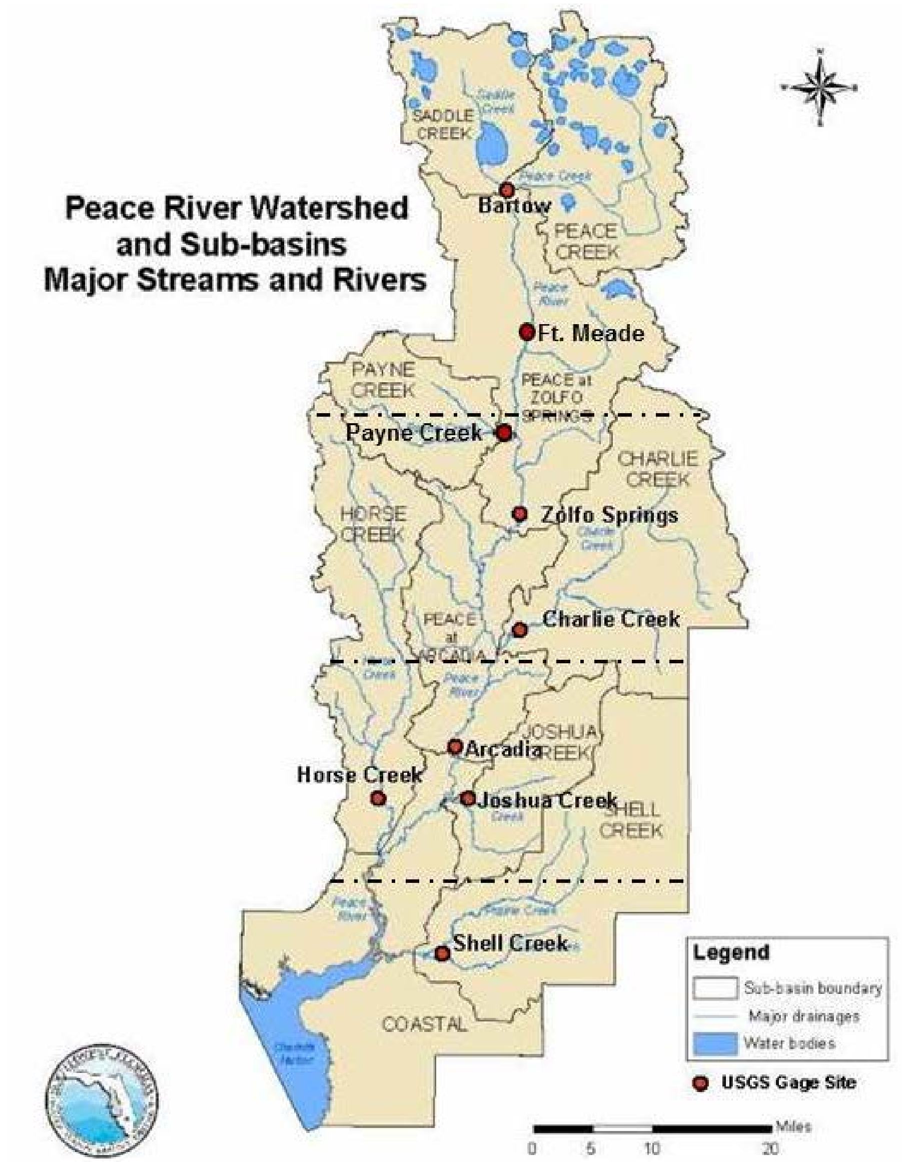


Figure 1. Map of Peace River watershed showing the main stem of river, major tributaries, and the locations of long-term USGS streamflow gages. Adapted from SWFWMD (2002).

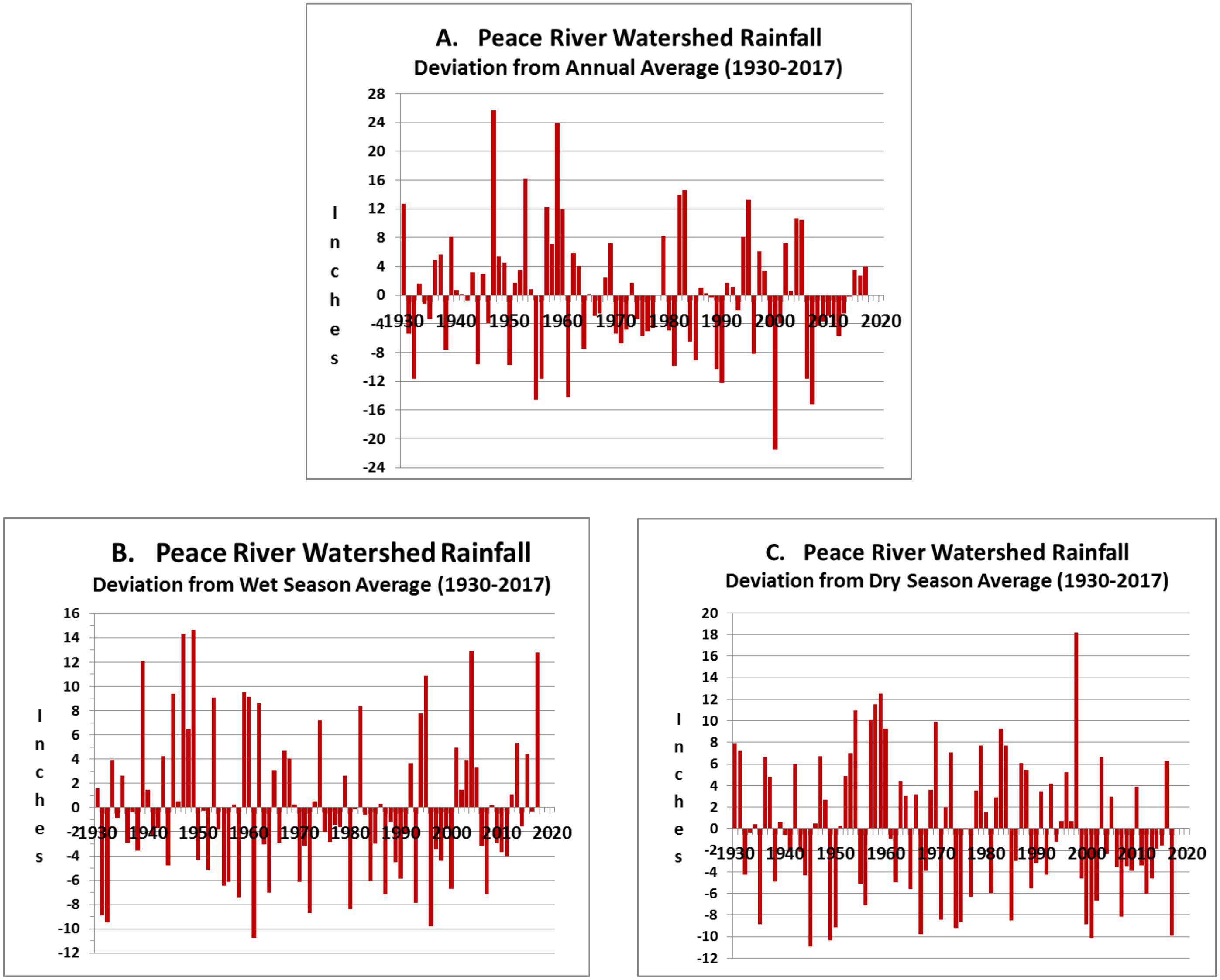


Figure 2. Yearly deviations from: (A) annual average; (B) wet season (June – September); and (C) dry season (October – May) average rainfall totals for the Peace River watershed taken from the regional rainfall summaries available from the Southwest Florida Water Management District website. Average rainfall totals for the 1930 to 2017 are annual - 52.2 inches, wet season - 31.5 inches, and dry season - 20.7 inches.

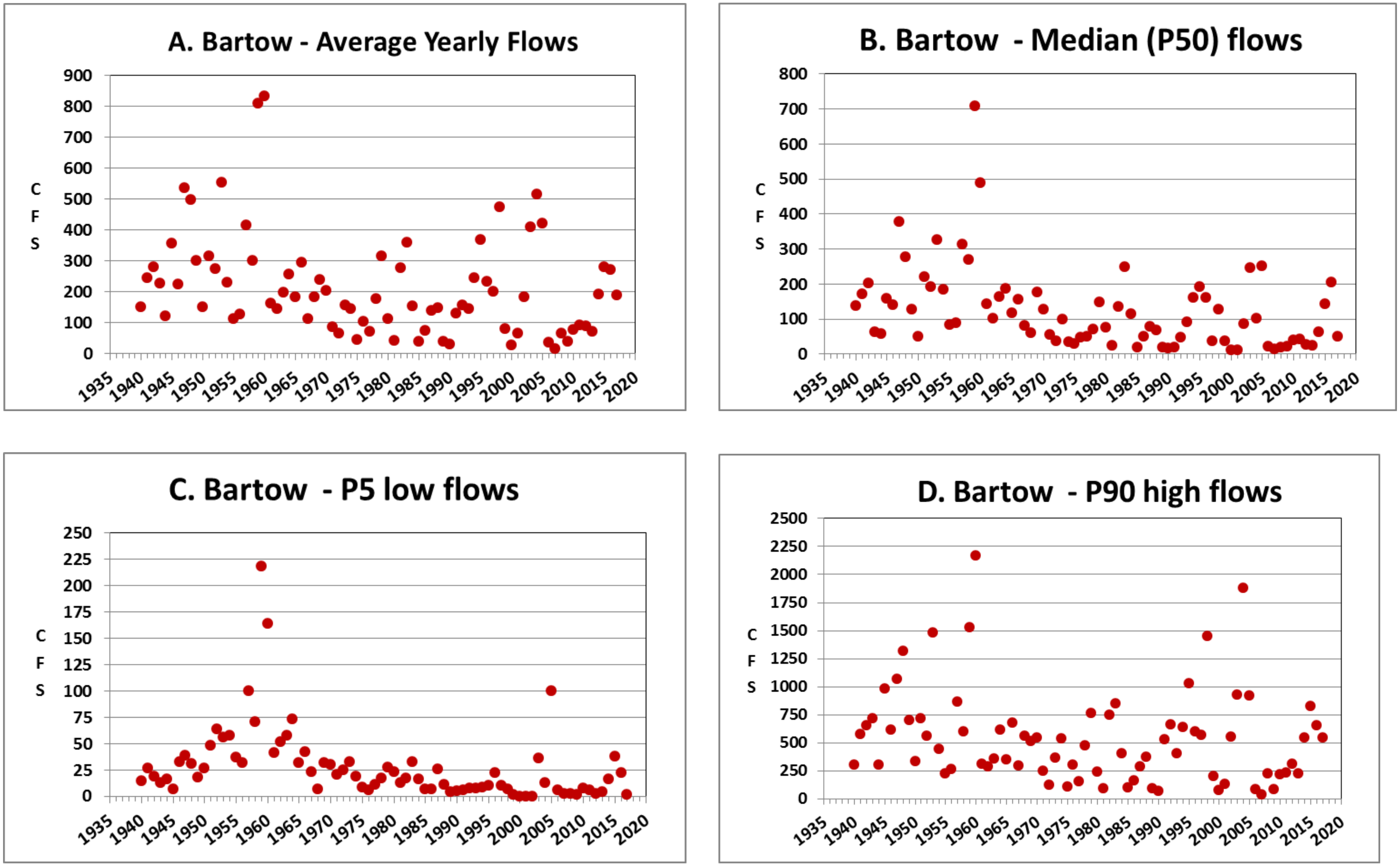


Figure 3. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Bartow gage for 1940 to 2017.

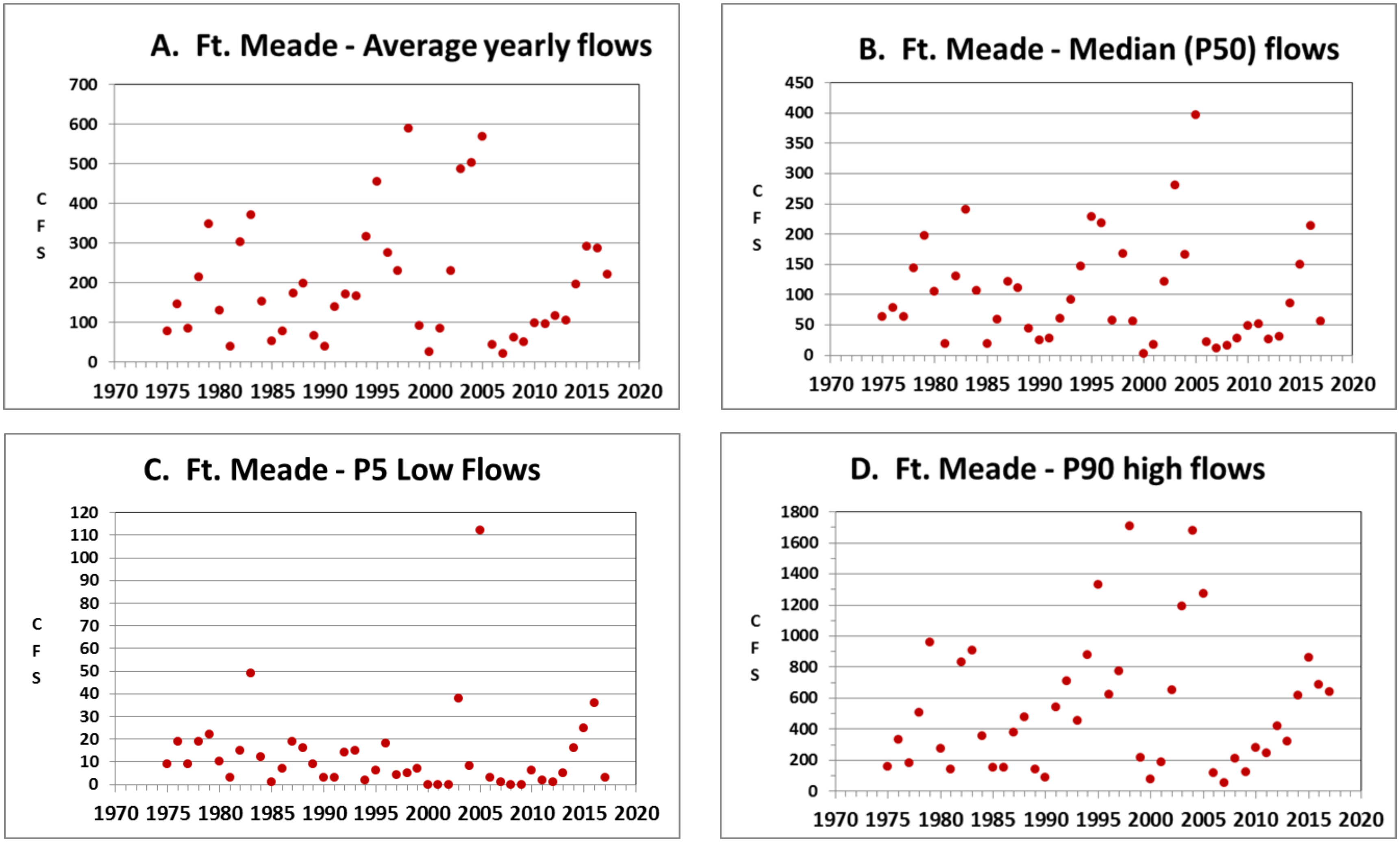
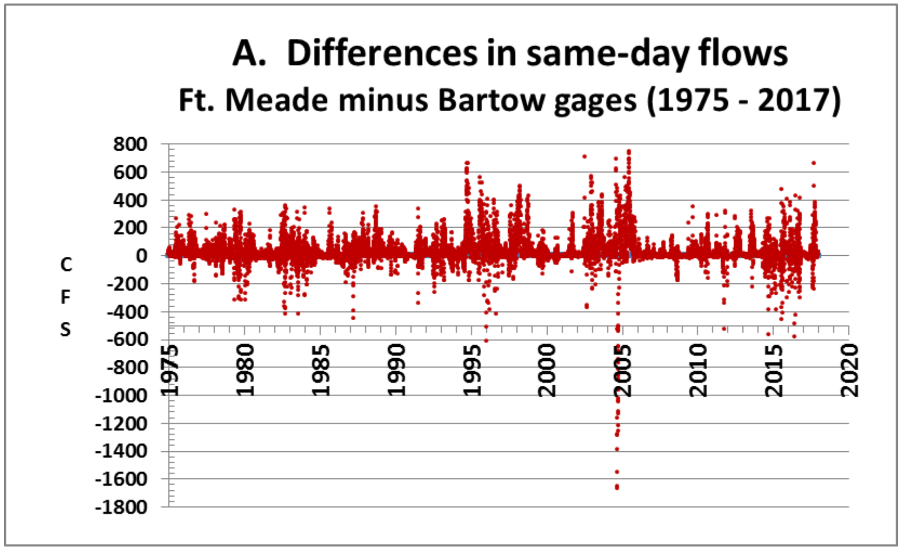


Figure 4. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Ft. Meade gage for 1975 to 2017.



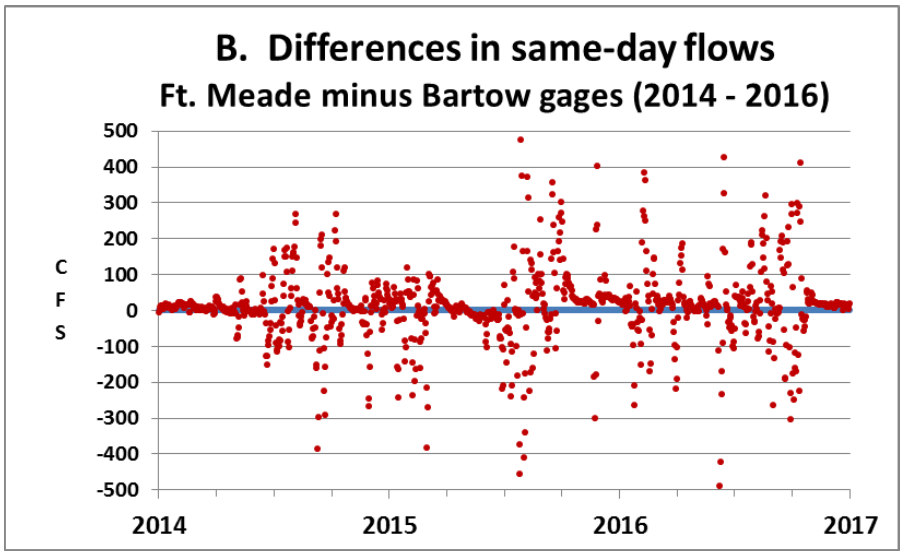


Figure 5. Hydrographs of differences in same-day flows reported by the USGS for the Peace River at Bartow and Peace River at Ft. Meade gages (Ft. Meade minus Bartow) for 1975 – 2017 and 2014 – 2016.

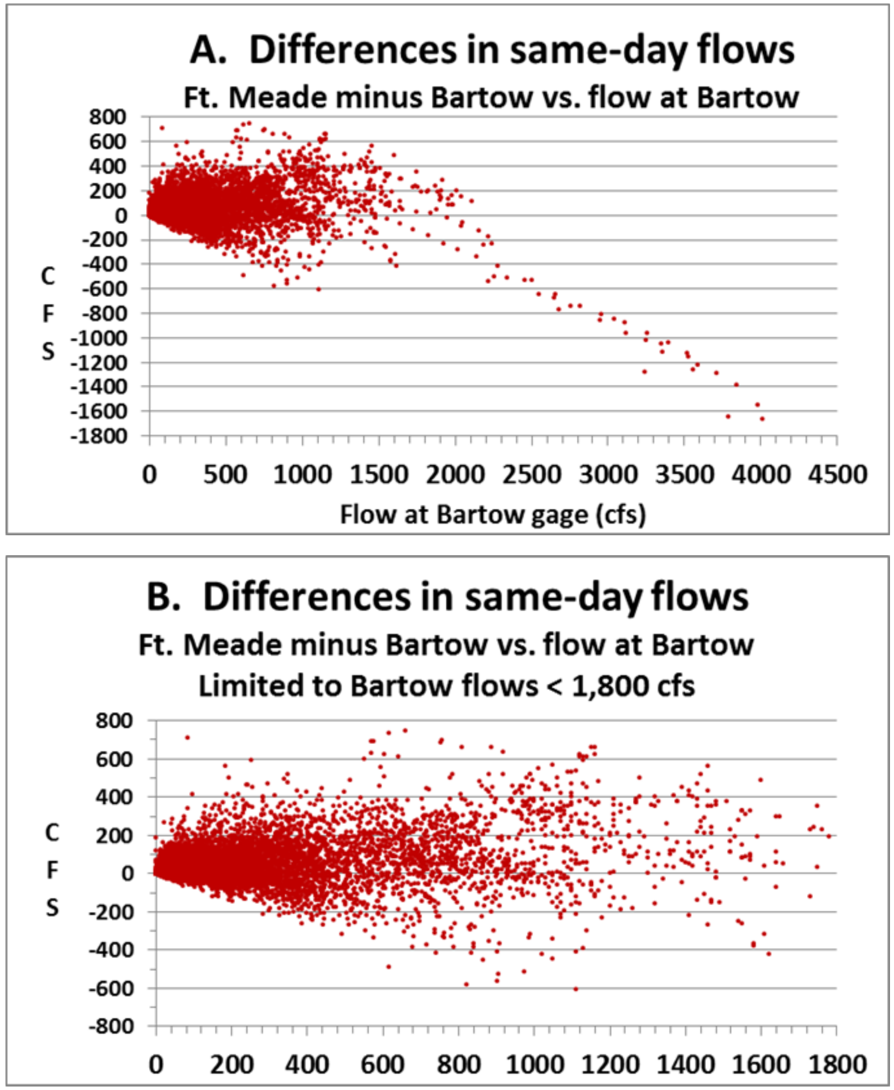


Figure 6. Hydrographs of differences in same-day flows reported by the USGS for the Peace River at Bartow and Peace River at Ft. Meade gages (Ft. Meade flow minus Bartow) versus the flow at Bartow. Hydrograph B is limited to flows at Bartow less than 1,800 cfs for better resolution. As described in the text, caution should be used in interpreting these graphs at very high flows when the river is well outside its banks.

Figure 7. Photographs of locations on the channel of the Upper Peace River between Bartow and Ft. Meade during droughts showing areas with no or very little water.

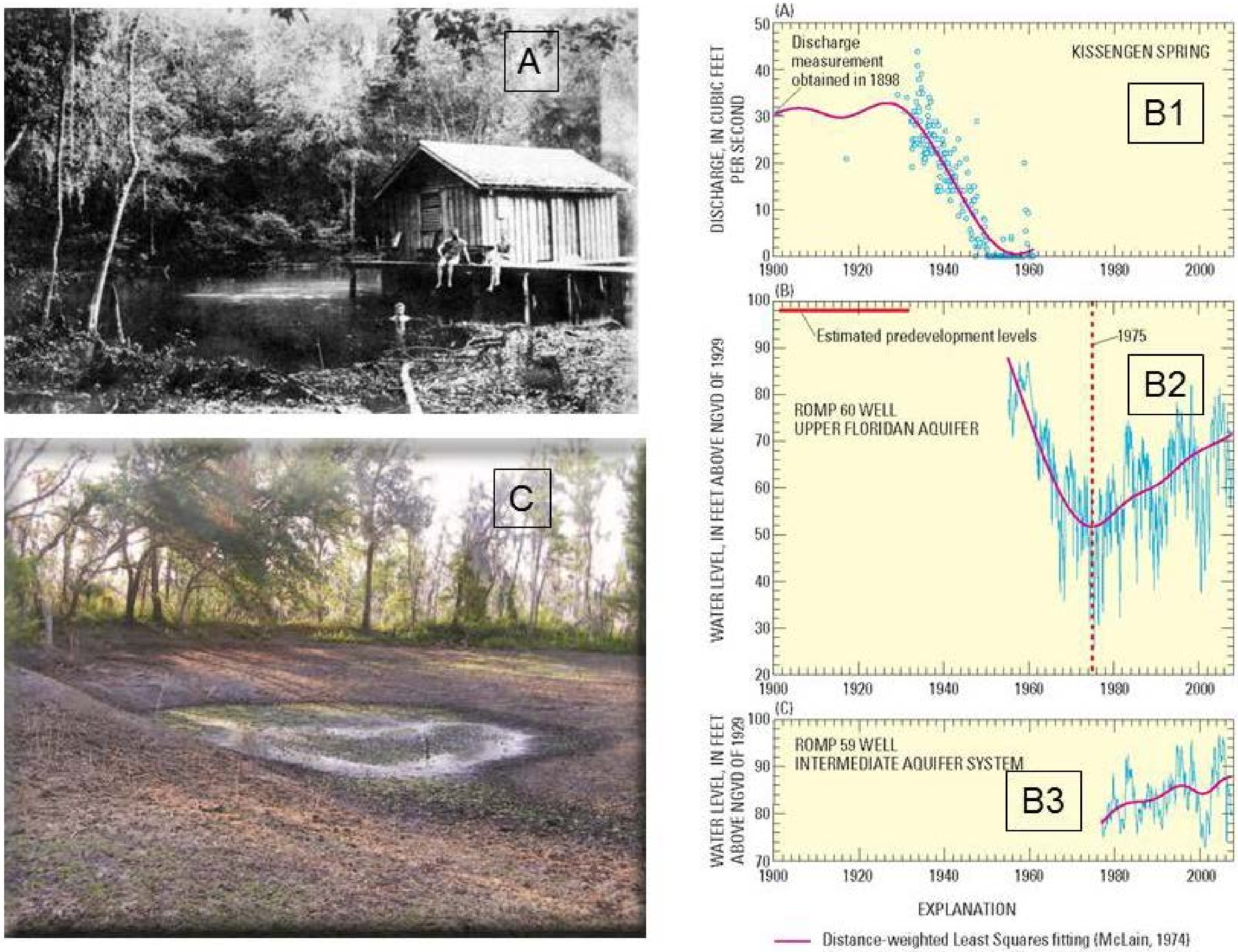


Figure 8. **A - Photograph of Kissengen Spring in 1894. B1 - Discharge from Kissengen Spring, B2- Water levels in Upper Floridan aquifer water levels at the Romp 60 well, and B3 - Water levels in the Intermediate aquifer at the Romp 50 well. C- Photograph of site of inactive Kissgengen Springs during 2006.**

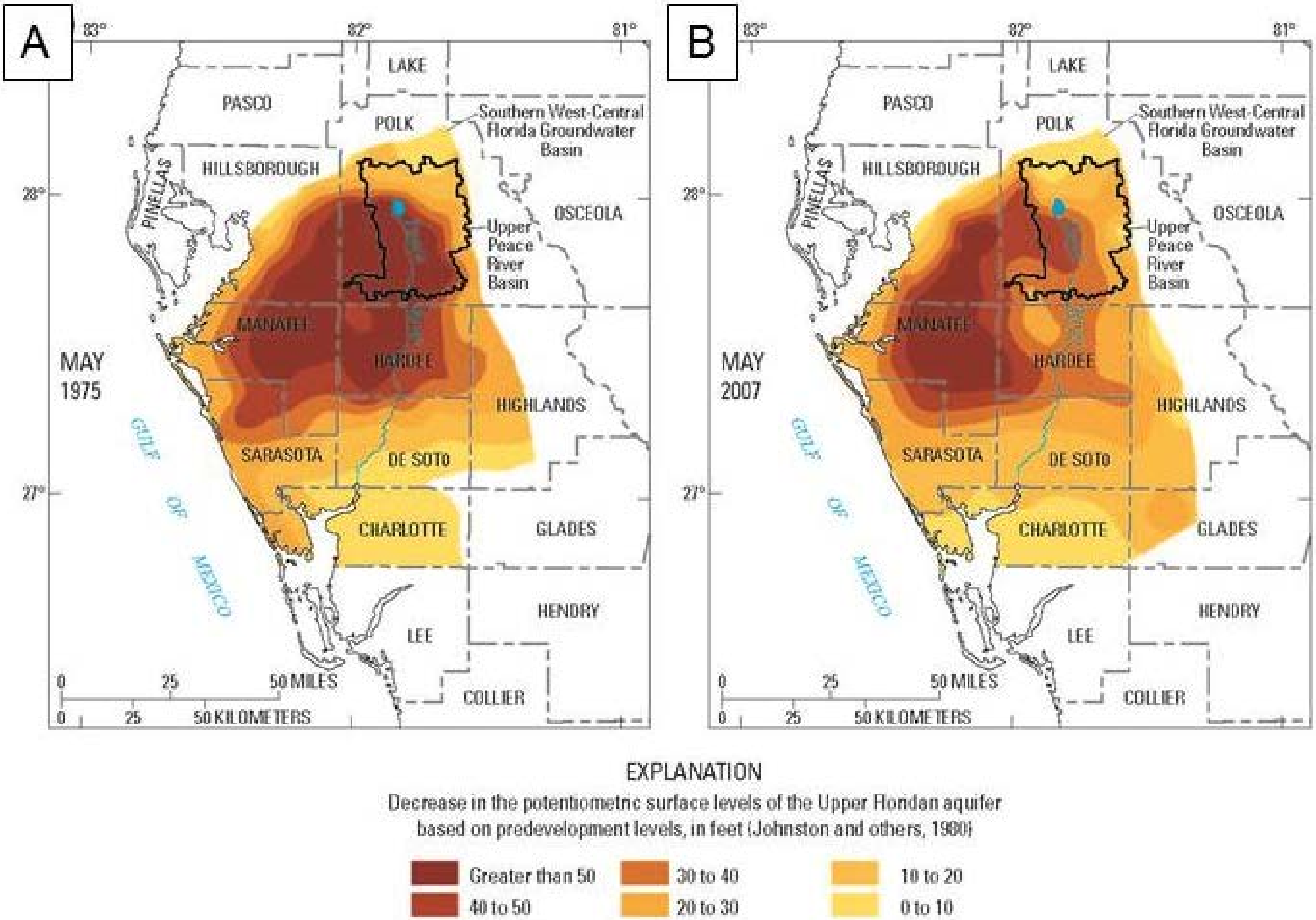


Figure 9. Changes in the potentiometric surface of the Upper Floridan aquifer in the Southern Groundwater Basin from estimated predevelopment conditions to 1975 (A) and 2007 (B). Adapted from Metz and Lewelling (2009).

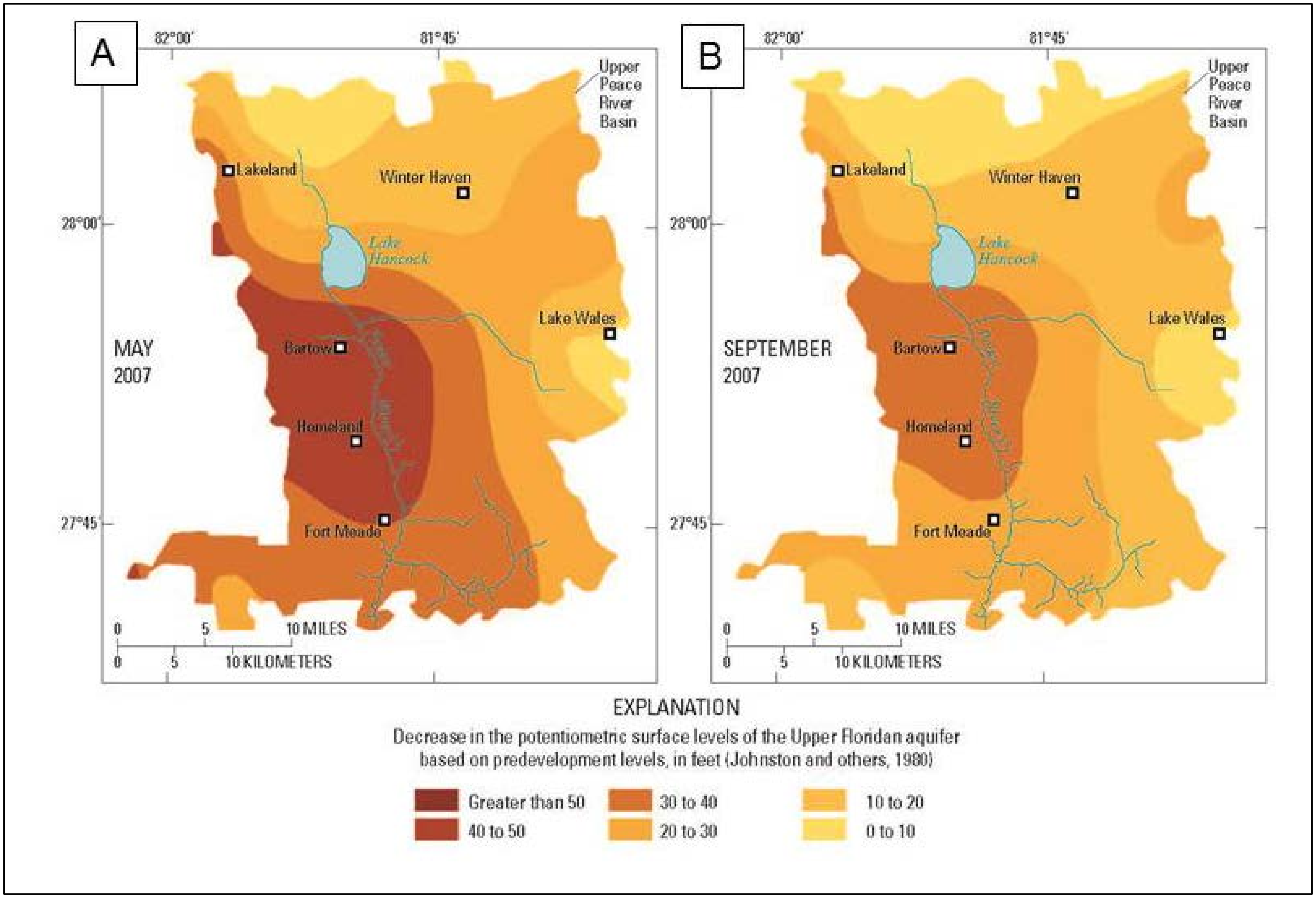


Figure 10. Changes in the potentiometric surface of the Upper Floridan aquifer in the upper Peace River basin from estimated predevelopment conditions and May 2007 (A) and September 2007 (B) levels. Adapted from Metz and Lewelling (2009).

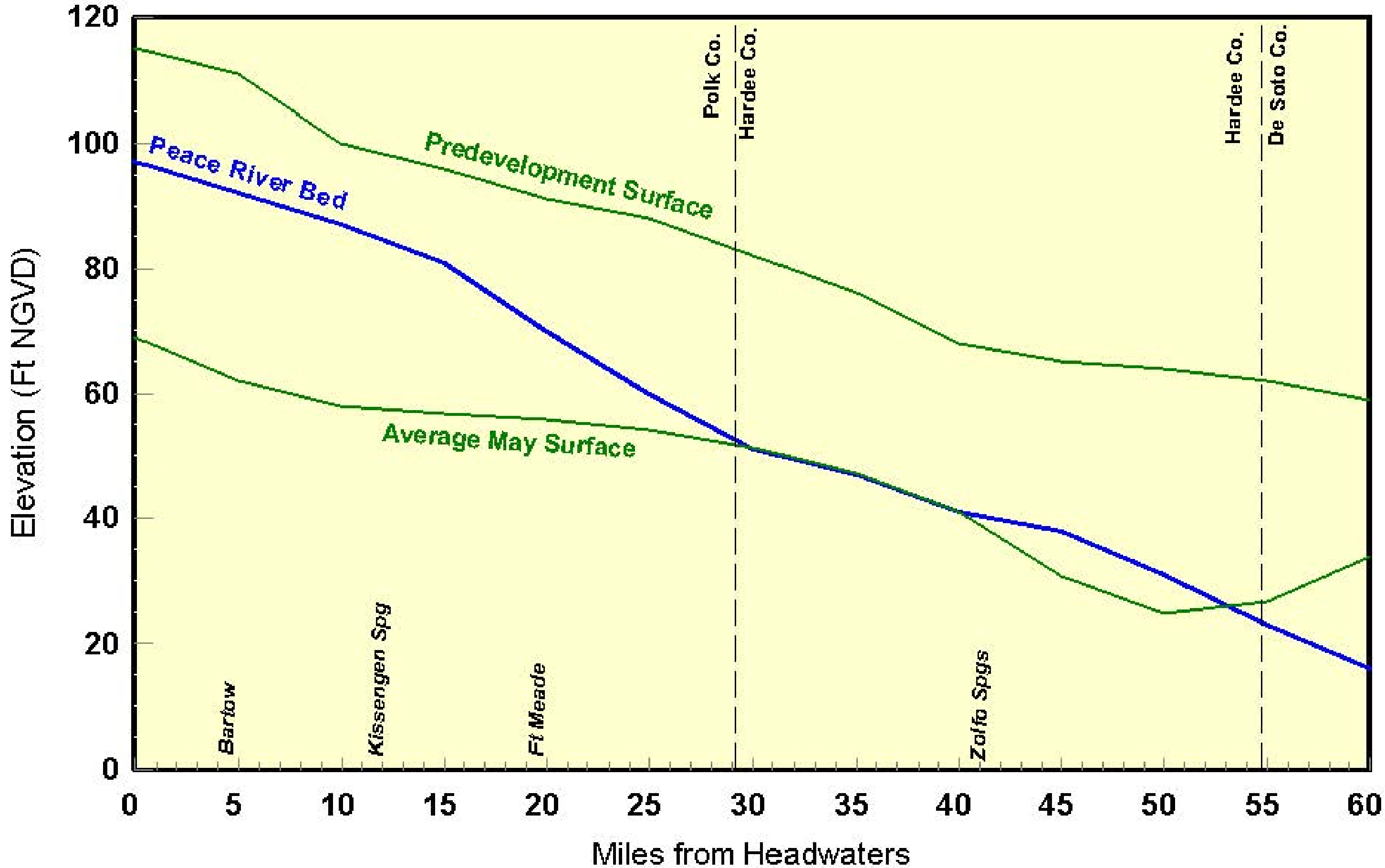


Figure 11. Generalized potentiometric surface of the Upper Floridan aquifer relative to the bed of the channel of Peace River for pre-development conditions and average May conditions for 1989-2002. Reprinted from Basso (2003).

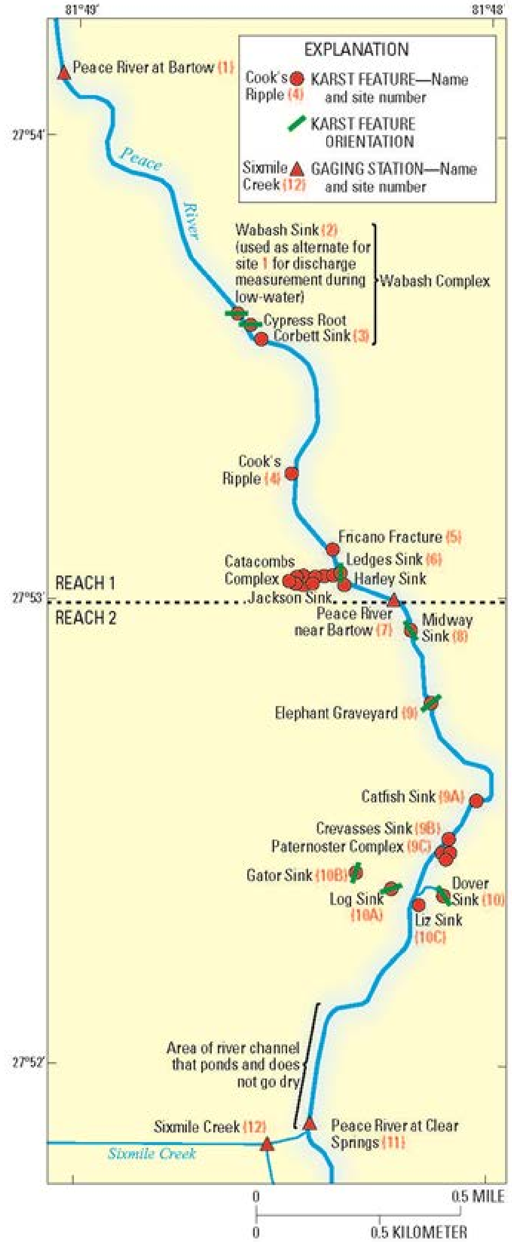


Figure 12. Location of karst features in reaches 1 and 2 of the Upper Peace River. Reprinted from Metz and Lewelling (2009).

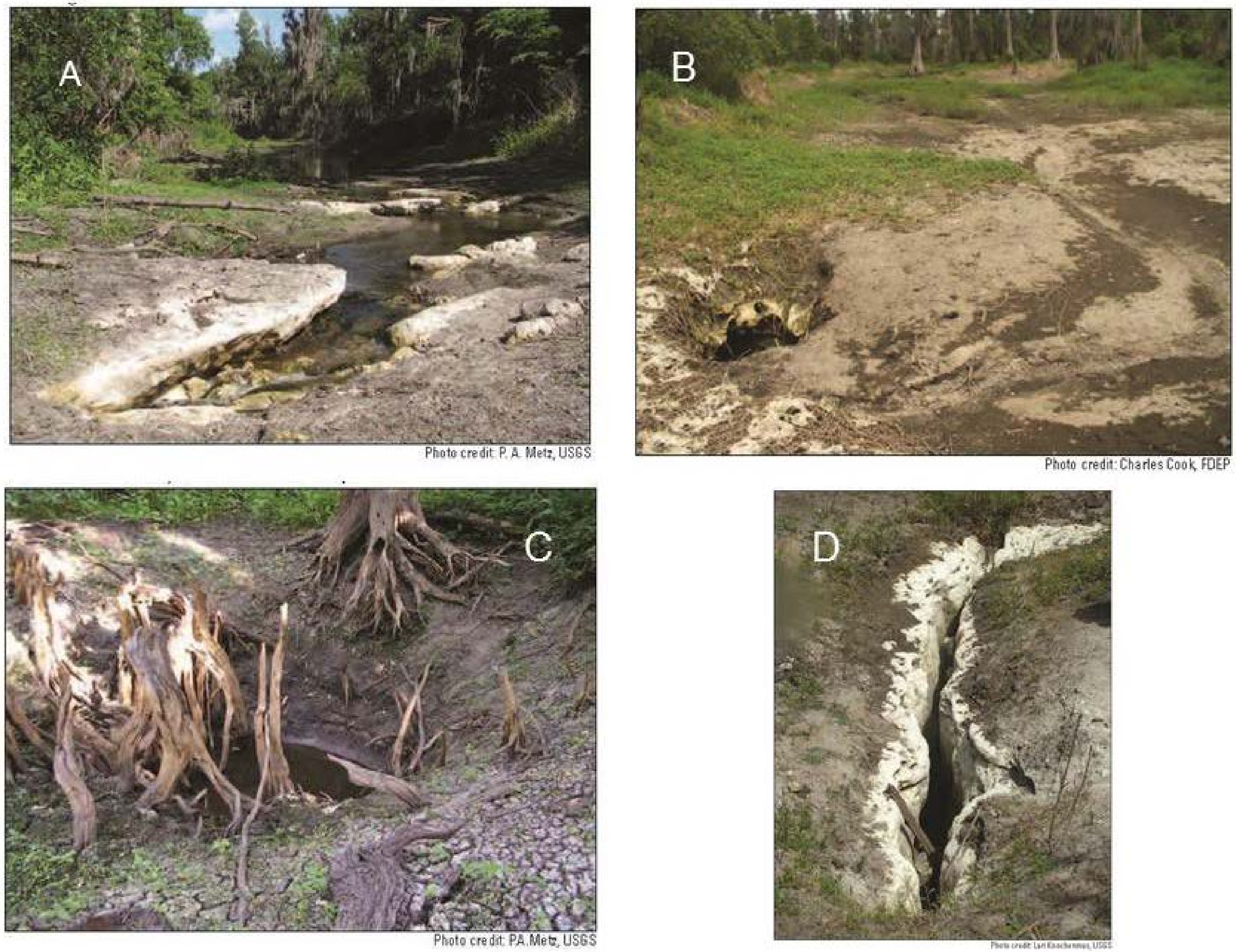


Figure 13. Photographs of sinks in the channel of the Peace River between Bartow and Ft. Meade: (A) Ledges sink; (B) Midway Sink; (C) Cavity near Wabash complex; (D) Crevasses Sink. Adapted from Metz and Lewelling (2009)

Photo credit: Charles Cook, FDEP

Photo credit: P. A. Metz, USGS

Figure 14. Photographs of sinks in the floodplain of the Peace River between Bartow and Ft. Meade: (A) Sink in eastern floodplain; (B) Gator Sink; (C) Dover Sink during dry conditions; (D) Dover Sink with ponded water during high river stage.

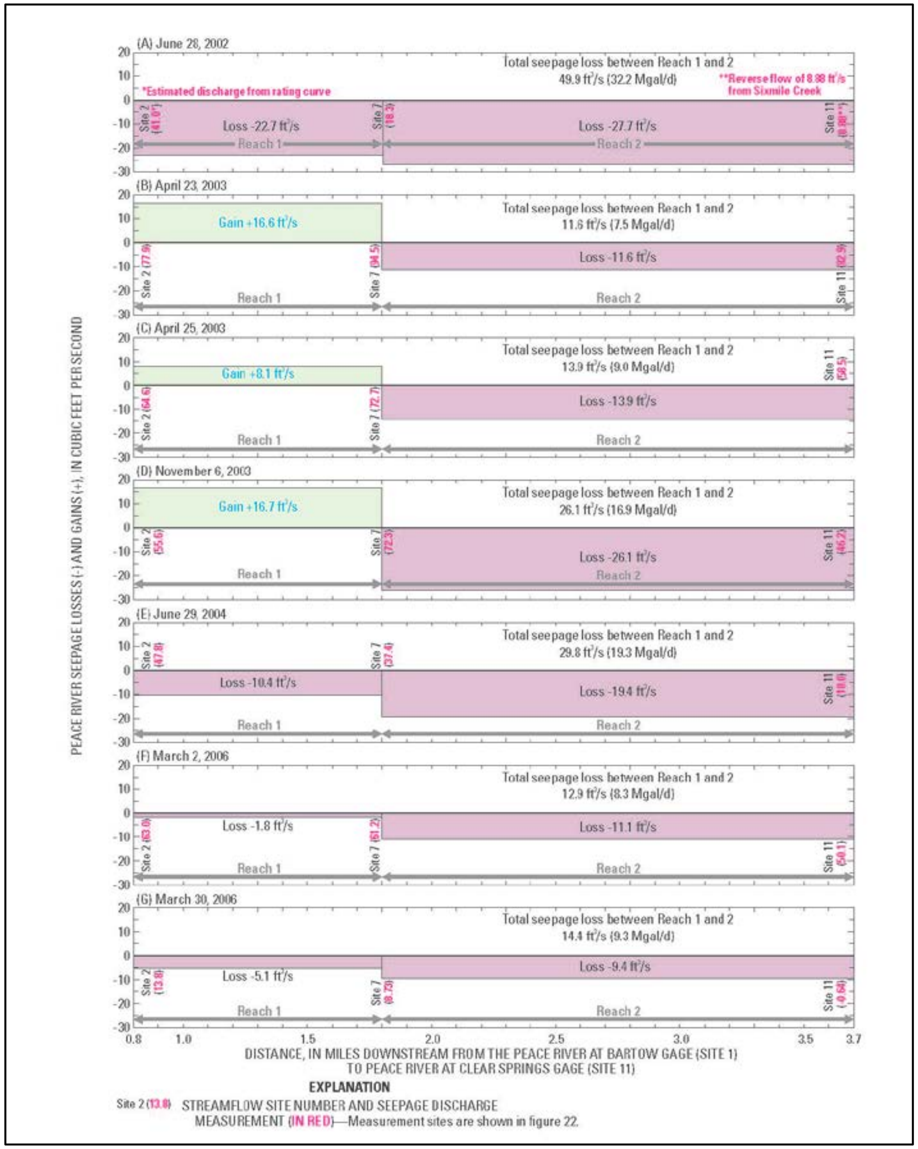


Figure 15. Streamflow gains and losses along reaches 1 and 2 from the Peace River at Wasbash (site 2) to the Peace River at Clear Springs gaging stations (site 11). Reprinted from Metz and Lewelling (2009).

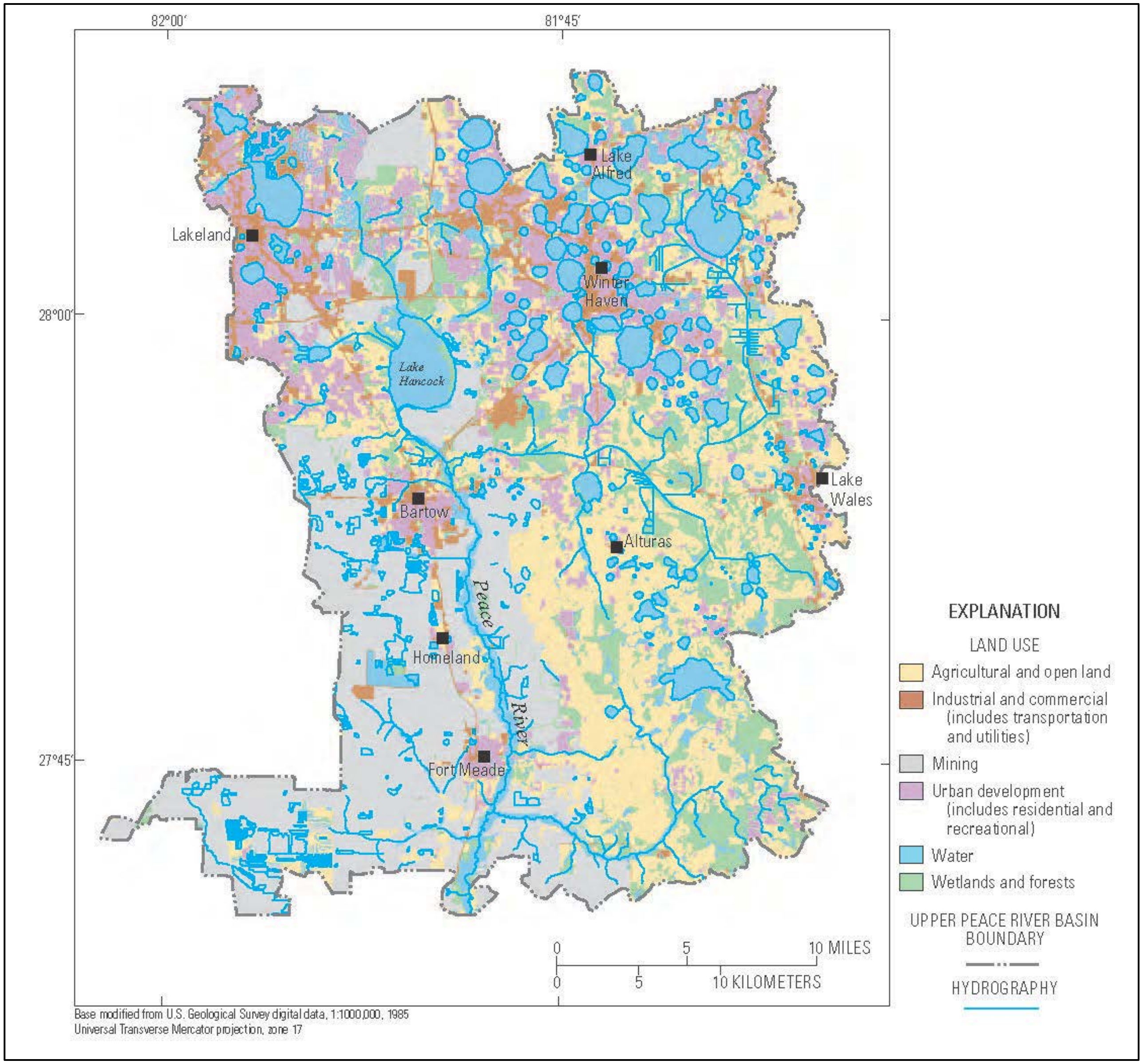


Figure 16. Major Land use categories in the Upper Peace River Basin for 2005. Reprinted from Metz and Lewelling (2009)

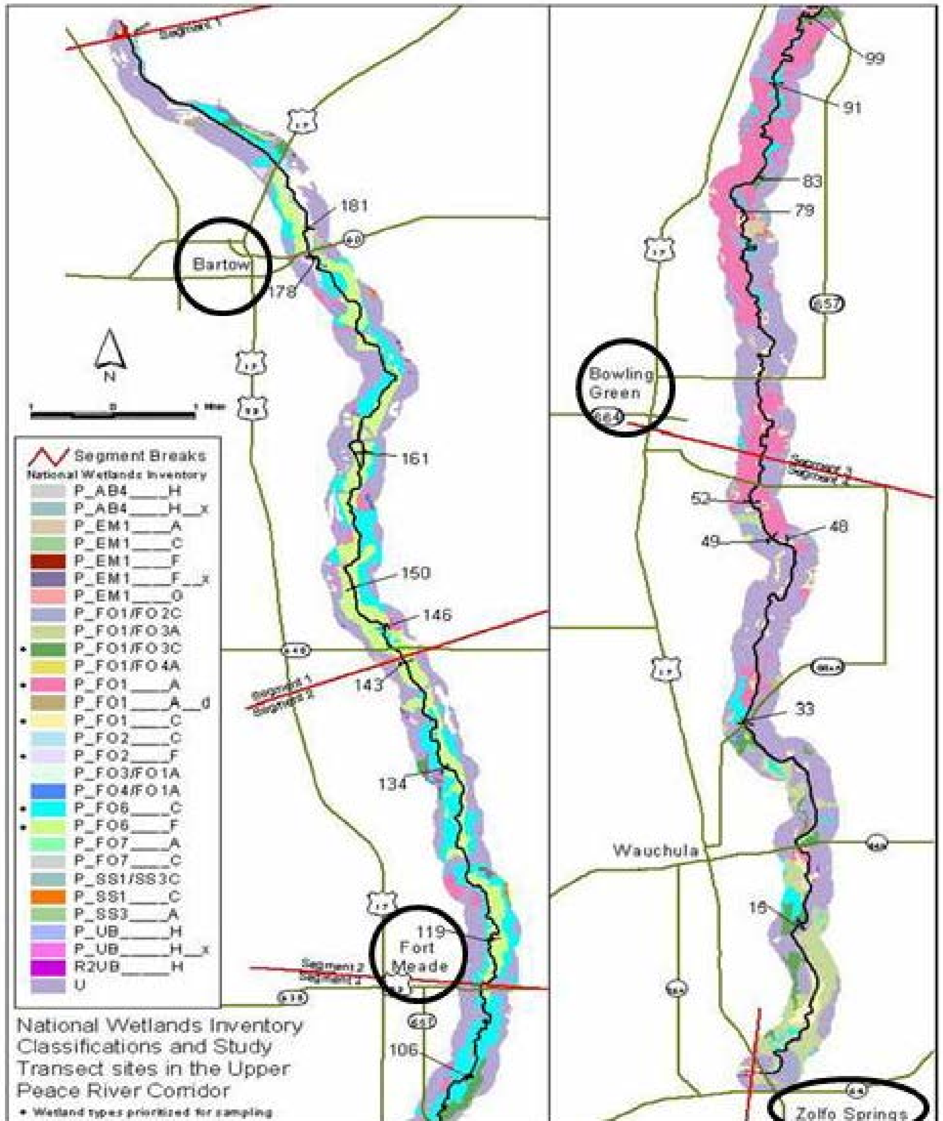


Figure 17. Distribution wetland types classified by the National Wetlands Inventory along the Upper Peace River from the origin of the Peace River above Bartow to Zolfo Springs. Towns are circled for geographic reference. Adapted from SWFWMD (2002).

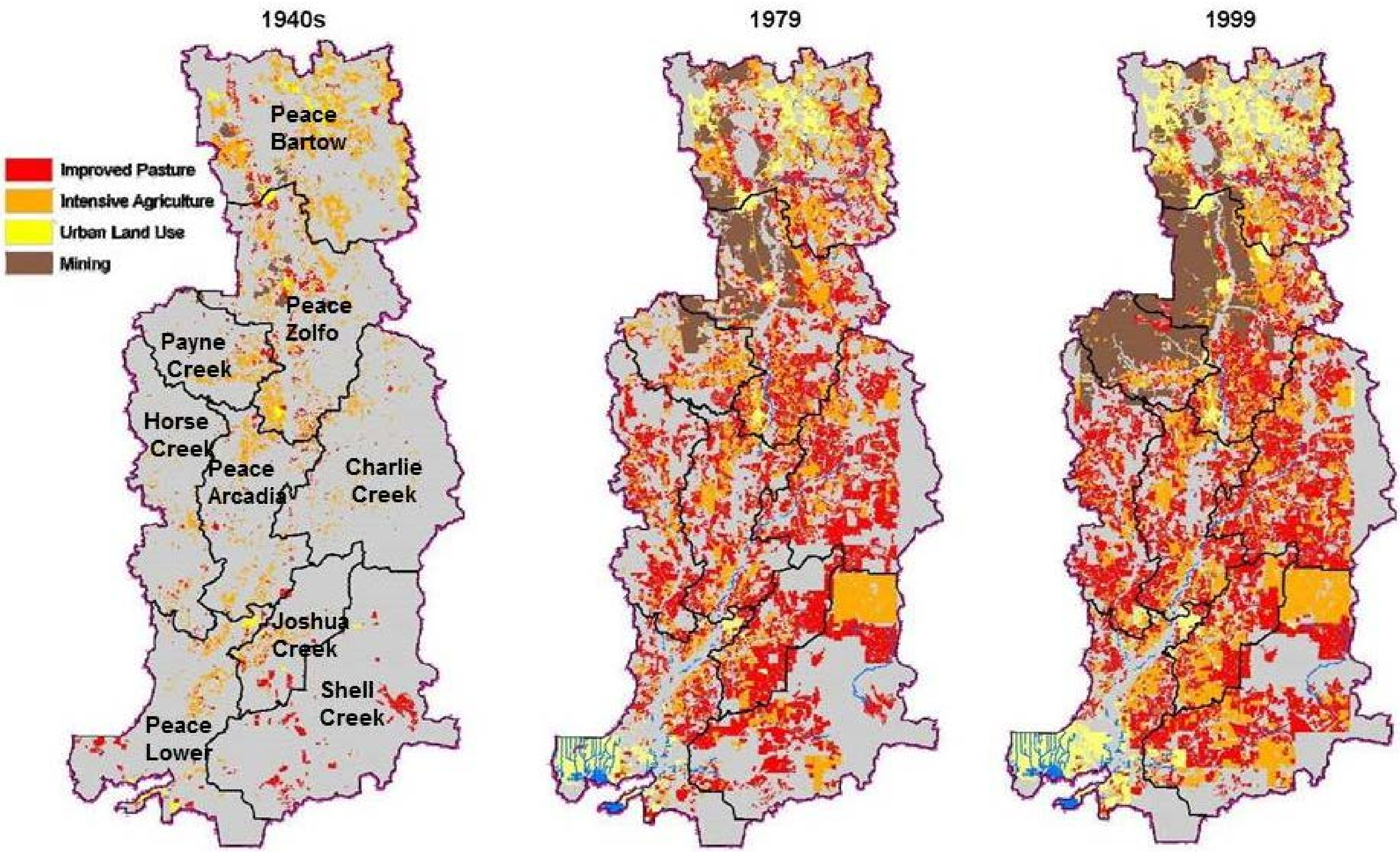


Figure 18. Distribution of major developed land uses in the Peace River watershed for the 1940s, 1979, and 1999. Major sub-basins labeled in the 1940s map for reference. Adapted from PBS&J and others (2007).

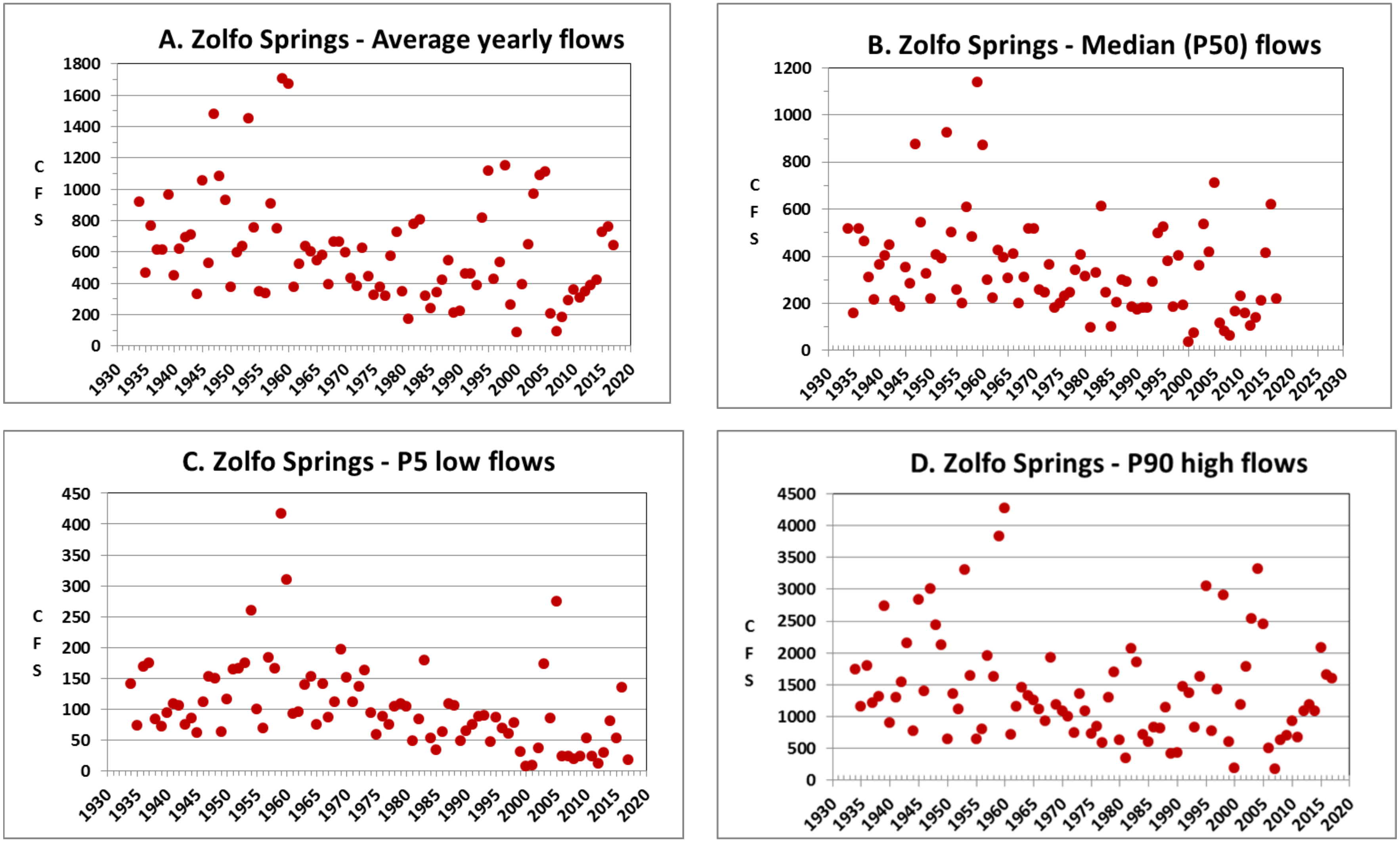


Figure 19. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Zolfo Springs gage for 1934 to 2017.

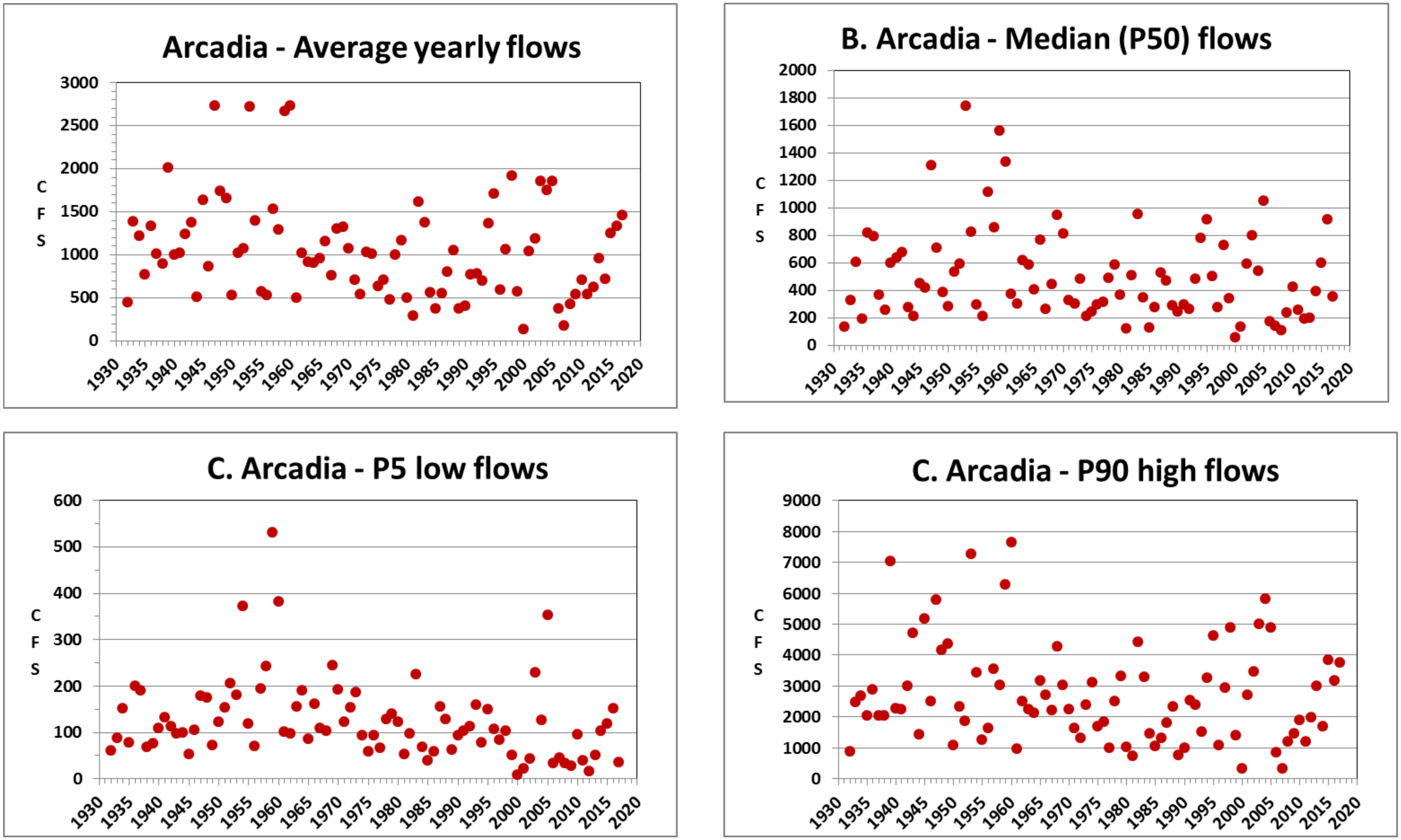


Figure 20. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Peace River at Arcadia gage for 1931 to 2017.

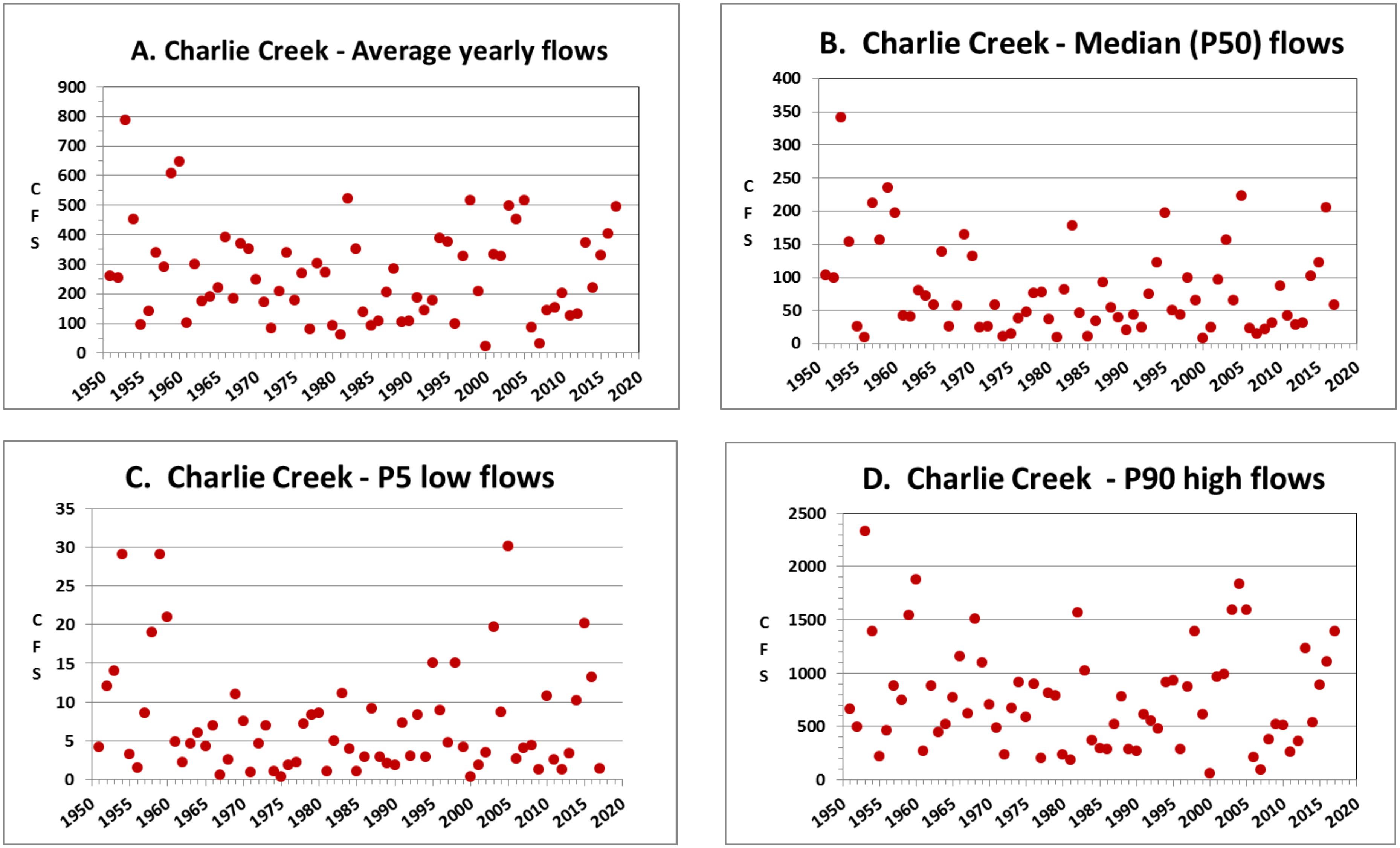


Figure 21. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Charlie Creek near Gardner for 1951 to 2017.

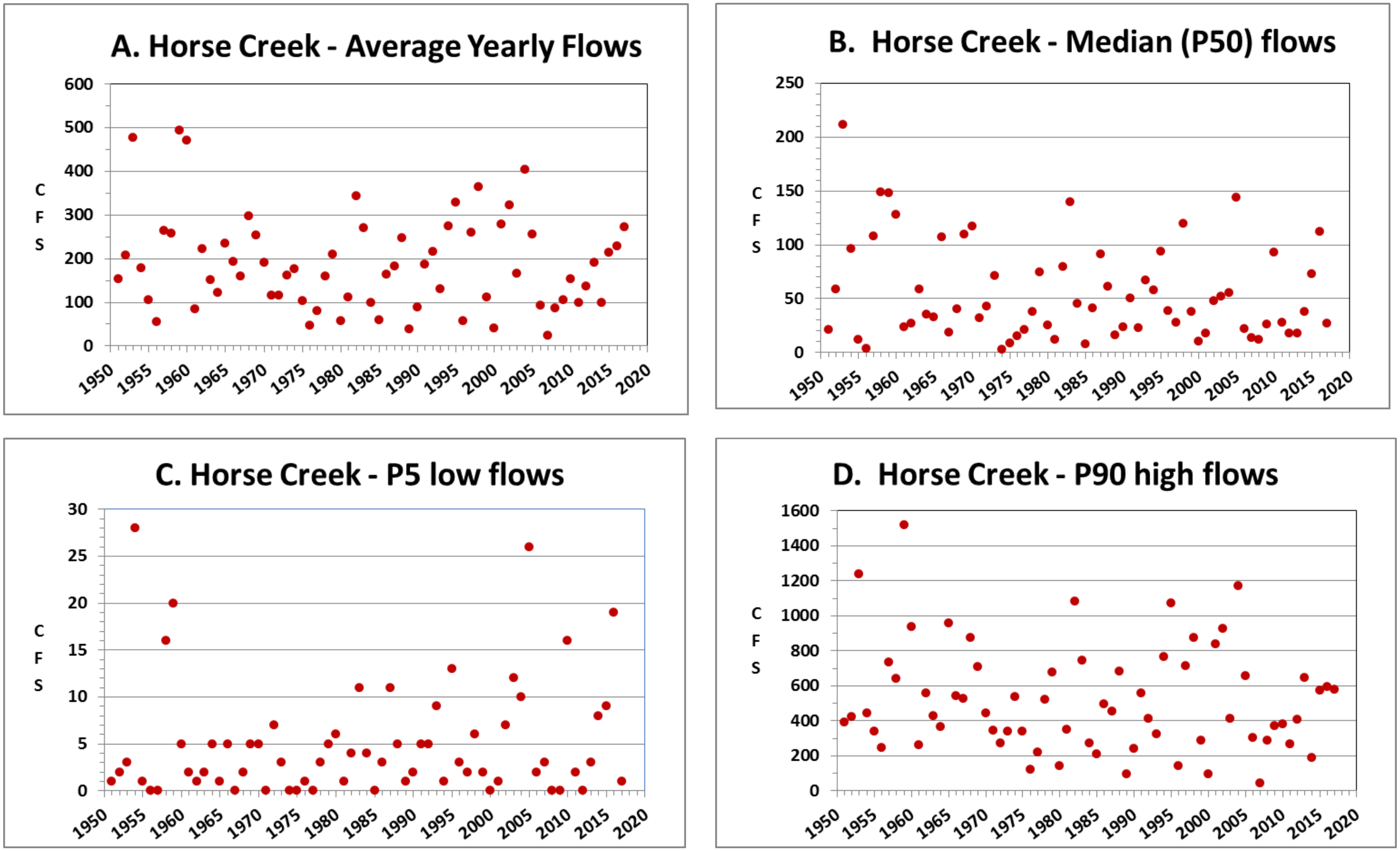


Figure 22. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Horse Creek near Arcadia for 1951 to 2017.

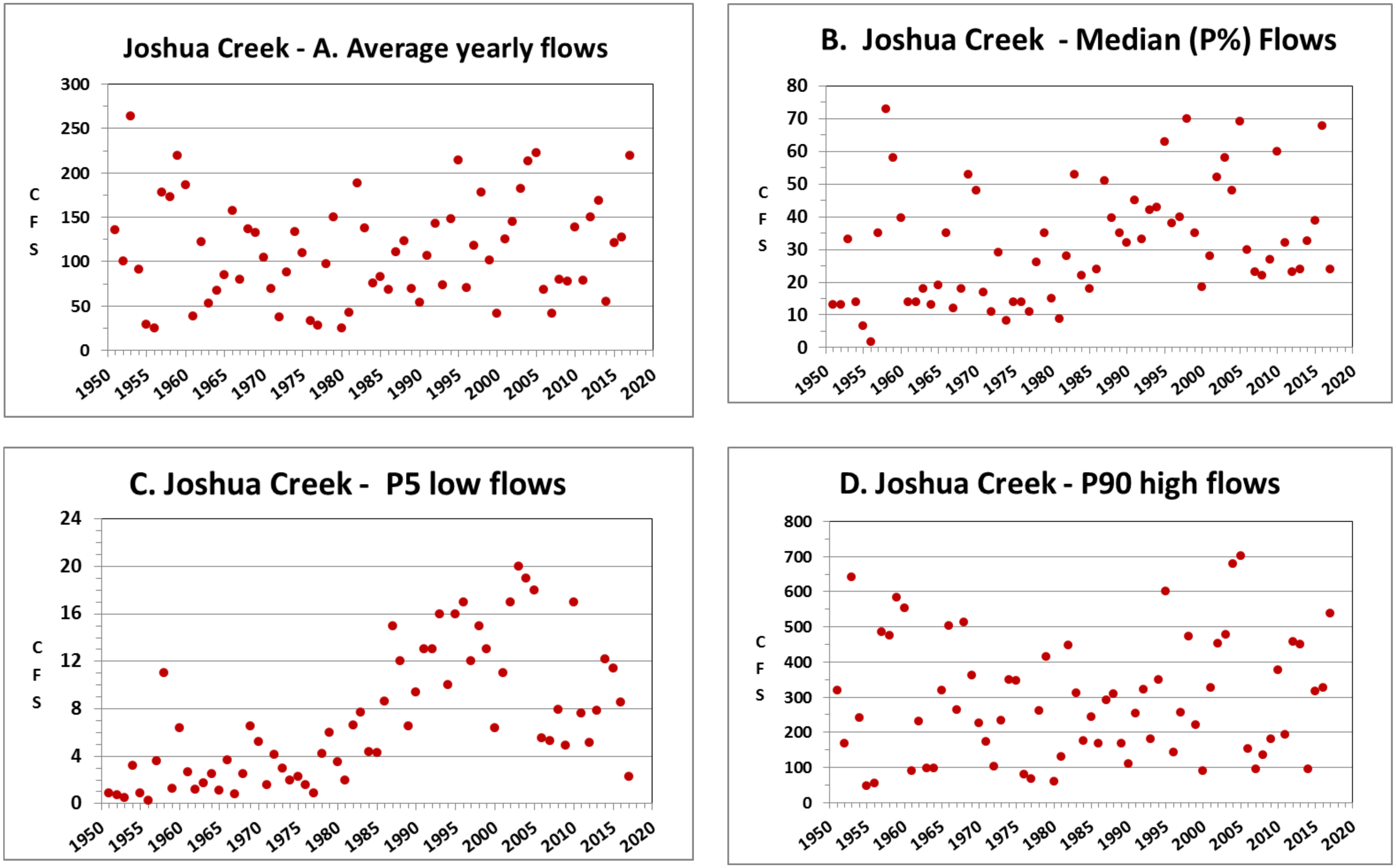


Figure 23. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Joshua Creek at Nocatee for 1951 to 2017.

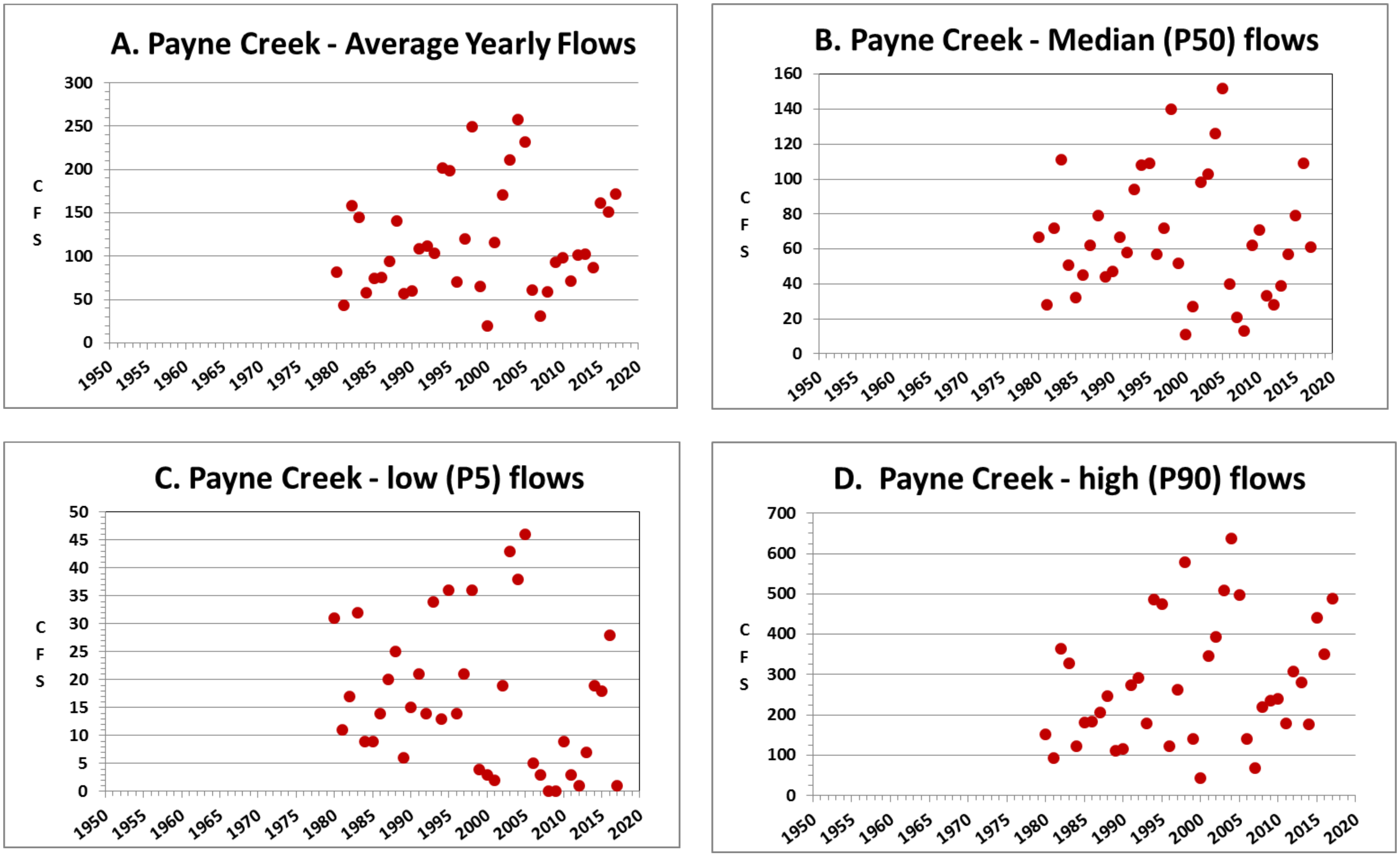


Figure 24. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Payne Creek near Bowling Green for 1980 to 2017.

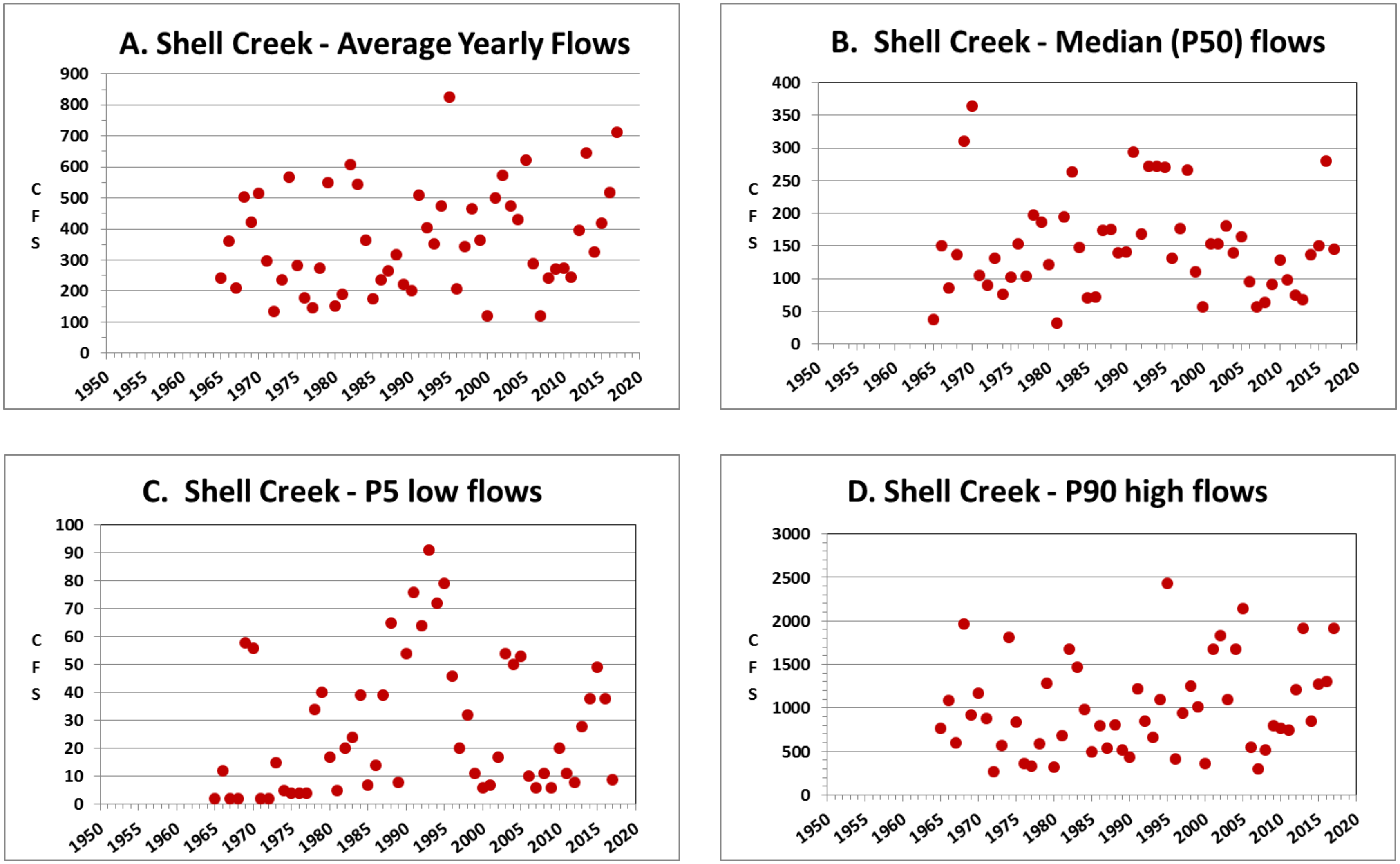


Figure 25. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for Shell Creek near Punta Gorda for 1965 to 2017.

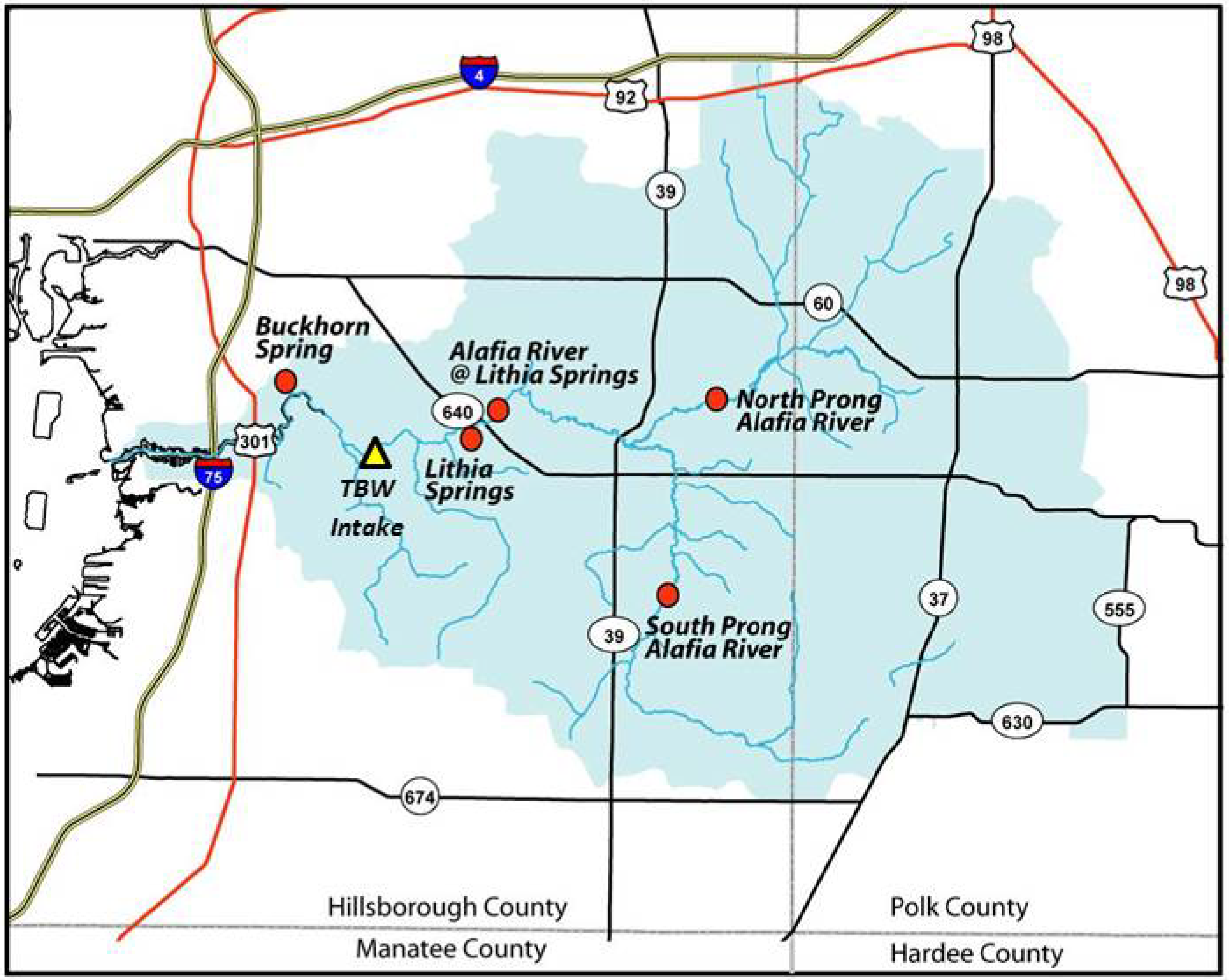
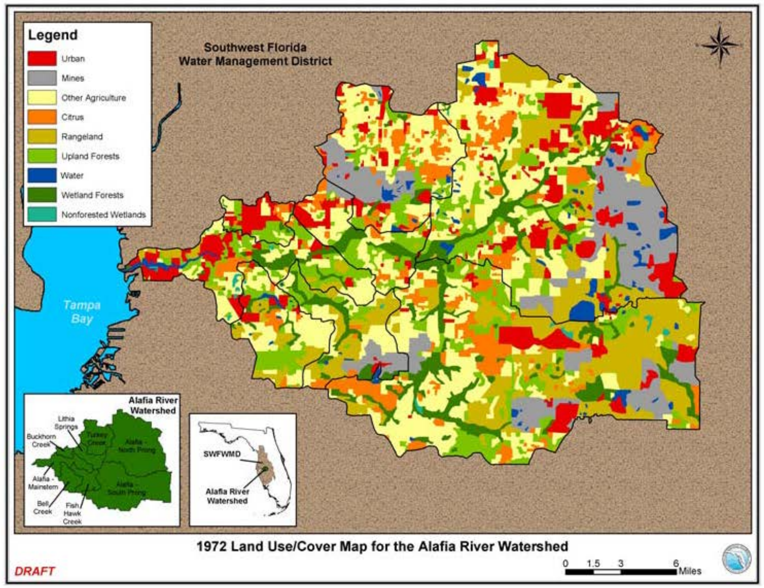


Figure 26. The Alafia River watershed showing the channels of the river and north and south prongs with the location of USGS gages on the Alafia River at Lithia, the North Prong near Keysville, and the South Prong near Lithia. Also shown is the location of Lithia and Buckhorn Springs and the intake site for Tampa Bay Water (yellow triangle). Adapted from SWFWMD (2005).



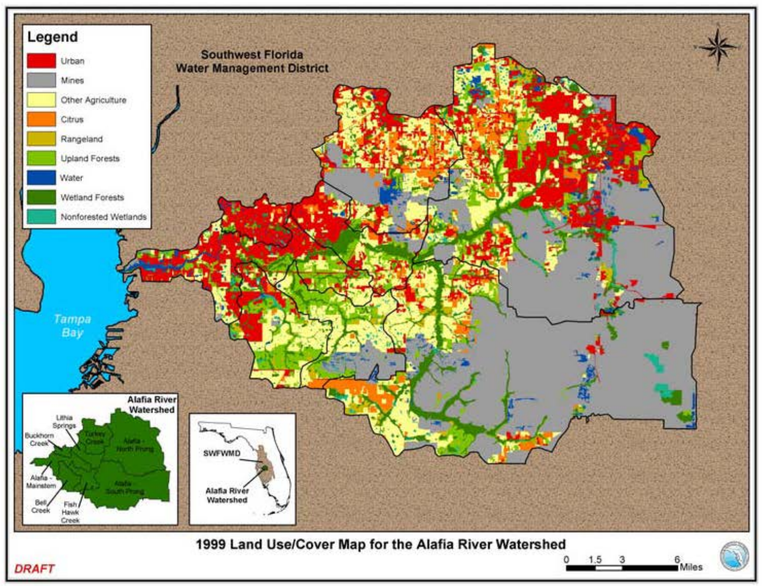


Figure 27. Major land use categories in the Alafia River watershed for 1972 (top) and 1999 (bottom). Reprinted from SWFWMD (2005).

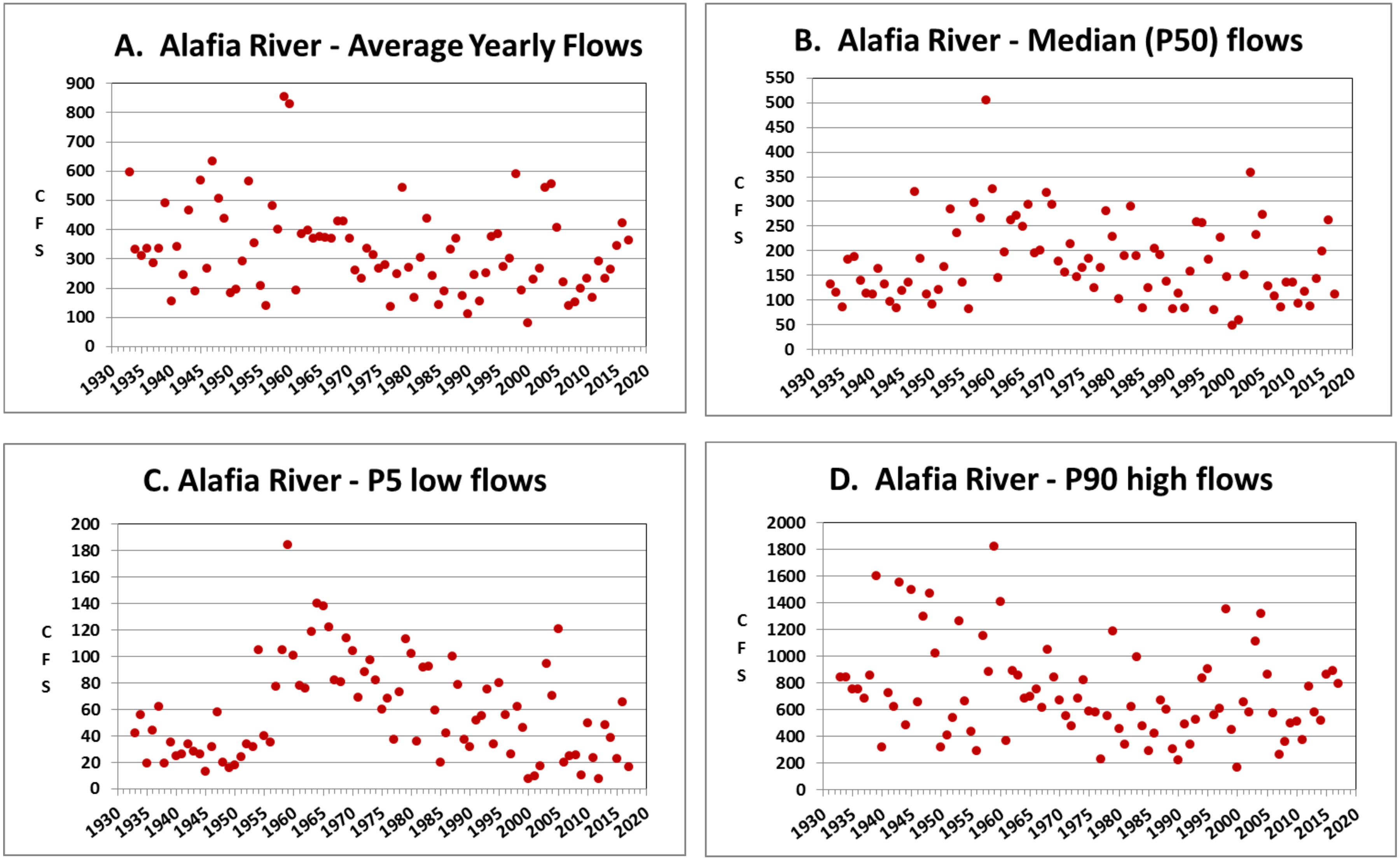


Figure 28. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the Alafia River at Lithia for 1933 to 2017.

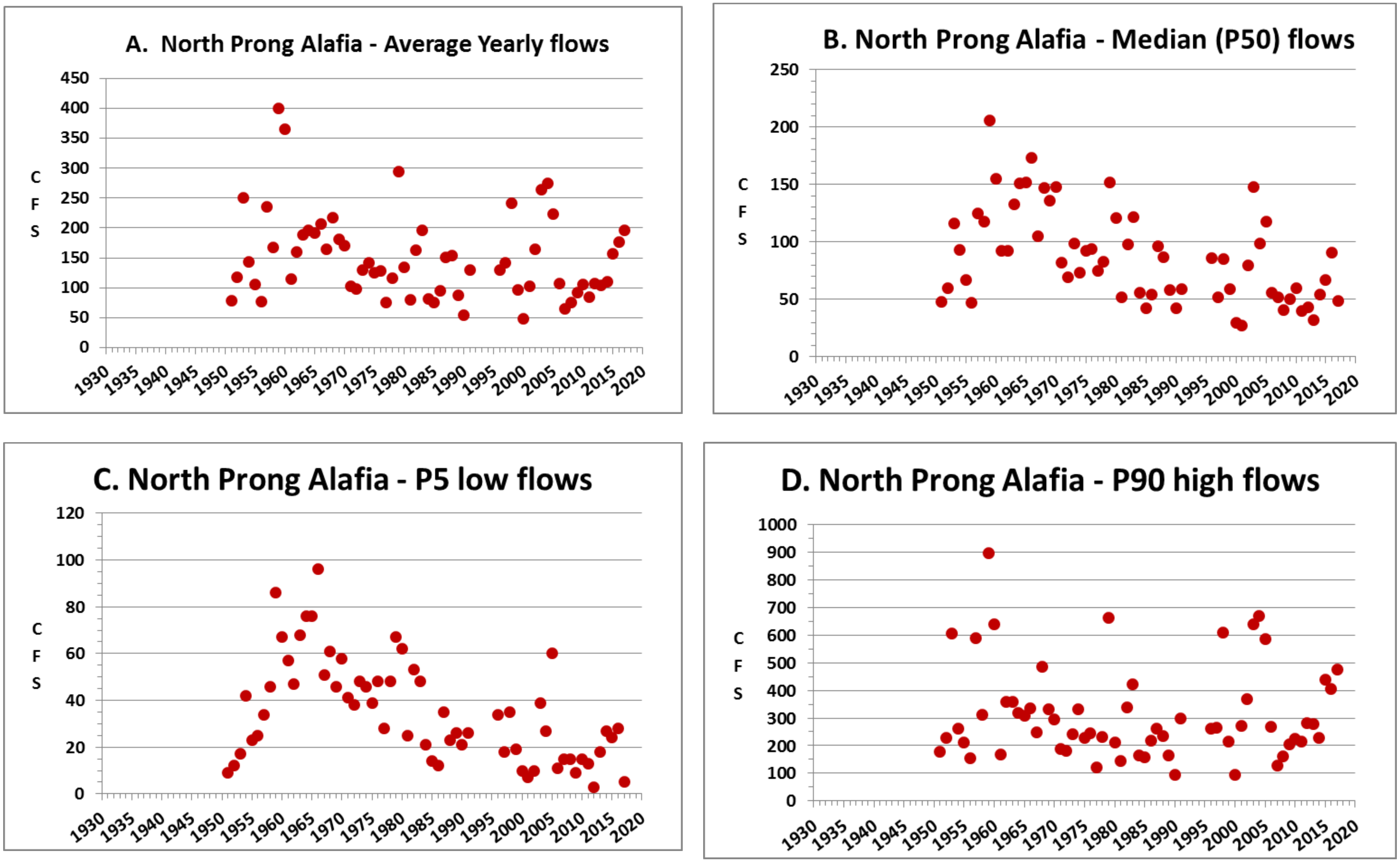


Figure 29. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the North Prong of the Alafia River at Lithia for 1951 to 2017. No values shown for 1992 - 1995 due to lack of complete daily data within those years.

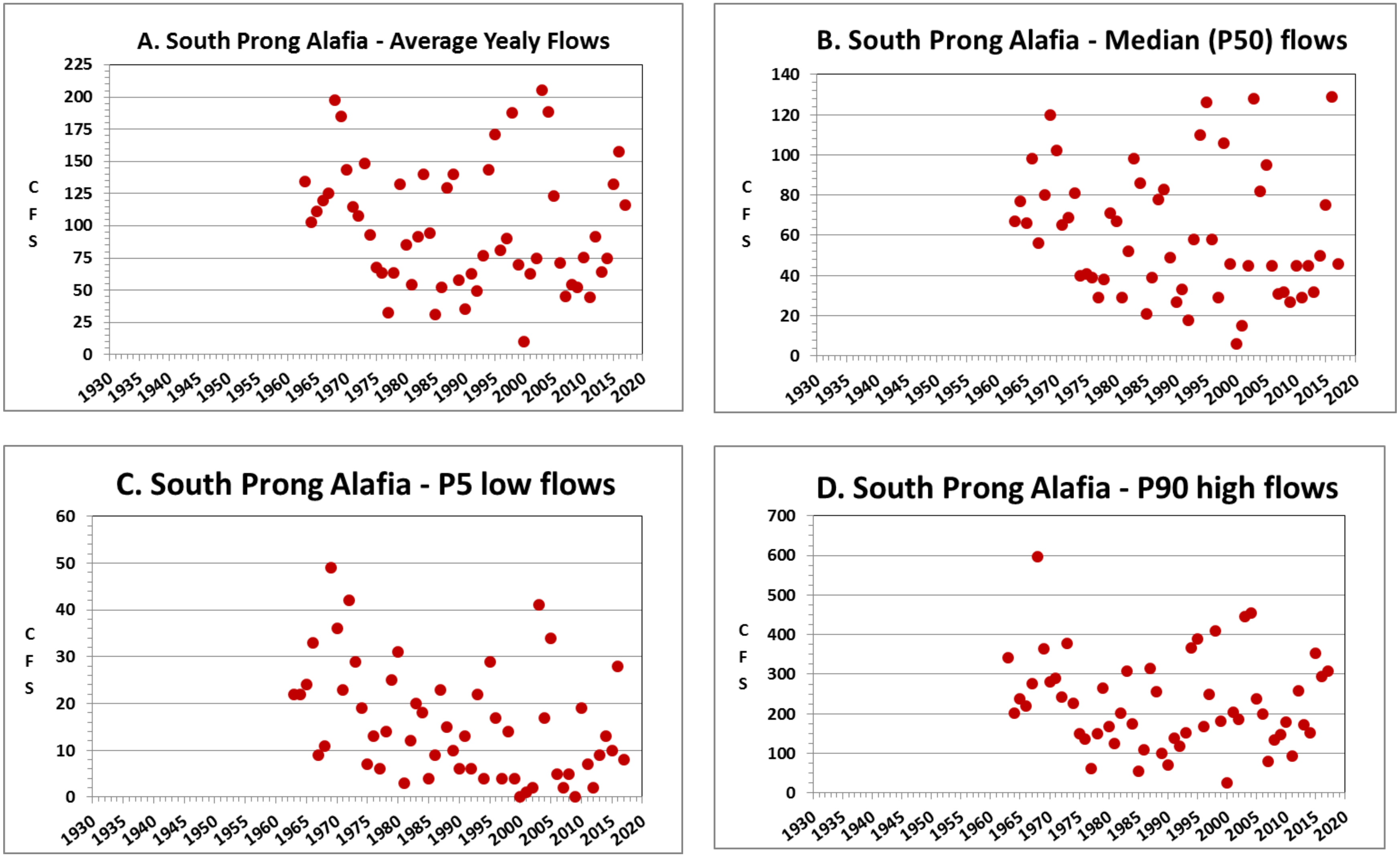


Figure 30. Hydrographs of yearly values for average, median (P50), fifth percentile (P5) and ninetieth percentile (P90) flows for the South Prong of the Alafia River near Lithia for 1951 to 2017.

Figure 31. The North Prong of the Alafia River approximately one mile above the confluence with the South Prong.

From:	Brian J. Armstrong
To:	Sid Flannery
Cc:	Eric DeHaven; Sky Notestein; Joel B. Brown; Cindy C. Rodriguez; Ted Gates; Darrin Herbst; Doug Leeper; Janie Hagberg; Jennette Seachrist; Karen West; Ron Basso; Luke LeMond; Randy Smith; Xinjian Chen; Yonas Ghile; Mark Fulkerson
Subject:	RE: Final version of my Peace and Alafia Rivers report
Date:	Wednesday, October 03, 2018 9:24:07 AM

Thank you Sid for your continued interest and support of our water resources. It appears you have copied the appropriate staff and I'll await their review.

From: Sid Flannery <sidflannery22@gmail.com>
Sent: Tuesday, October 2, 2018 1:53 PM
To: Brian J. Armstrong <Brian.Armstrong@swfwmd.state.fl.us>
Cc: Eric DeHaven <Eric.Dehaven@swfwmd.state.fl.us>; Sky Notestein <Sky.Notestein@swfwmd.state.fl.us>; Joel B. Brown <Joel.Brown@swfwmd.state.fl.us>; Cindy C. Rodriguez <Cindy.Rodriguez@swfwmd.state.fl.us>; Ted Gates <Ted.Gates@swfwmd.state.fl.us>; Darrin Herbst <Darrin.Herbst@swfwmd.state.fl.us>; Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>; Janie Hagberg <Janie.Hagberg@swfwmd.state.fl.us>; Jennette Seachrist <Jennette.Seachrist@swfwmd.state.fl.us>; Karen West <Karen.West@swfwmd.state.fl.us>; Ron Basso <Ron.Basso@swfwmd.state.fl.us>; Luke LeMond <Luke.LeMond@swfwmd.state.fl.us>; Randy Smith <Randy.Smith@swfwmd.state.fl.us>; Xinjian Chen <Xinjian.Chen@swfwmd.state.fl.us>; Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>; Mark Fulkerson <Mark.Fulkerson@swfwmd.state.fl.us>
Subject: Final version of my Peace and Alafia Rivers report

Dear Mr. Armstrong,

Attached is the final version of my report titled "A watershed based approach for the assessment of potential new surface water withdrawal sites from the Peace and Alafia Rivers."

As with the draft report, the Figures occur after the text in the report, but are also provided as a separate file for easier simultaneous viewing with the text. I also made a couple of additions to the Summary which are highlighted in a short 4 page file of the title page and the summary.

I will also be sending this report and figures (not the highlighted summary) to the Peace River Manasota Regional Water Supply Authority, the Polk Regional Water Cooperative, and Tampa Bay Water.

This report took a fair amount of work, but it was worth in as I got to pay homage to one of my heroes - Ellis Lanquist. **Go Gators!! Bulls too!!**

Best Regards,

Sid Flannery

From: Sid Flannery
To: Sky Notestein; Doug Leeper
Subject: Happy Tuesday - a few emails coming
Date: Tuesday, December 04, 2018 7:41:50 AM

Hello Doug and Sky,

Later this morning I am going to send MFL staff three emails dealing with the subjects below. The staff who are working on those projects will be copied.

1. Was a maximum diversion capacity utilized in the Lower Peace River and Shell Creek MFL analyses. Fine if not, but will affect some results based on average flow values (i.e., Rubec's report).

2. I am willing to sample zooplankton one more time in Morris Bridge Sink.

3. Can Secchi disc or other water clarity data be incorporated in the Lower Hillsborough five-year MFL report.

I hope this is not too hard for Doug to deal with after the UGA Bulldogs suffered another defeat at the hands of the Crimson Tide. I played Crosby, Stills, Nash and Young's "Deja Vu" on WMNF on Monday in honor of that loss, which was eerily similar to last year. I was pulling for the Dawgs.

Sid

From:	Sid Flannery
To:	Sky Notestein; Doug Leeper; Yonas Ghile; Xinjian Chen
Subject:	Lower Peace River minimum flows
Date:	Tuesday, December 04, 2018 10:04:44 AM
Attachments:	COVER, TABLE 1 and FIGURE 4 - Rubec Peace Charlotte Harbor Fish Geographic Analysis.pdf New seasons paragraph.docx

Hello Doug, Sky, Xinjian and Yonas,

I have been reviewing a draft journal article being prepared by Peter Rubec concerning his recent project with the District using spatial HSM modeling to simulate changes in habitats and abundance of various life stages of selected species in the Lower Peace River and Charlotte Harbor. He also sent me the report he recently completed for the District. Review of that report raises the question of whether or not the District utilized a maximum diversion limit in the minimum flows analysis for the Lower Peace River and Shell Creek.

It is fine if you did not, but the existing minimum flow rule for the Lower Peace includes a maximum diversion of 400 cfs. That was put in by Marty for there were concerns expressed by the public about the ecological effects of extremely large amounts of fresh water being diverted from the river and harbor. In my mind it is okay not to include a maximum diversion limit in the rule, but not having a maximum diversion limit will influence the results of some analyses. Without going into detail, it might make some results more conservative, but the effects of very large diversions on the results should be considered.

What brought this to mind is included in two pages from Rubec's report for the District. Attached is a file of the cover page, Table 1 and Figure 4 from that report. Table 1 shows the mean flow values for baseline and minimum flow conditions for the years 2007 to 2014. I was initially surprised to find that the minimum flows would allow a 32.5% reduction of the baseline flows during the three month season of April through June. The average withdrawals were least (26.6%) during the winter (January - March), but the 2007-2014 period was unusual for that three-month period had the lowest average baseline flows, which is not the typical seasonal pattern.

Figure 4 on page 3 of the attached file has an inset that lists the minimum flow percentages for different flow classes in the Lower Peace River and Shell Creek. It also shows a hydrograph of flows for baseline and minimum flow conditions for the Lower Peace River. This graph shows very large differences between these two flows when baseline flows are high, indicating that no maximum diversion limit was utilized.

For the Lower Peace, the minimum flows allow a withdrawal of 40% when baseline flows are over 622 cfs. I assume it is these 40% withdrawals that affect the large differences between the two flow conditions during high flows shown in Figure 4. Baseline flows were over 622 cfs for 33.7% of the time during 2007-2014, with a mean value 8,440 cfs when flows were over 622 cfs. It is easy to understand how 40% withdrawals during high flows could affect the large percentage differences in average flow conditions listed in Table 1. This would vary between seasons, but be in effect to some extent in all.

Rubec's HSM results were based on average flow and salinity conditions for the four three-month seasons. Because the average minimum flows were so heavily influenced by very large withdrawals during high flows, his results based on average flows should be viewed as worst case condition that are probably not physically feasible from the water supply perspective.

In general, the expression of long-term average flow values can mask the protective attributes of the percent of flow method, for during prolonged periods of low and medium flows, which are often during the peak recruitment season for many species, the percent flow reductions will actually be much smaller than indicated by the average values. Caution should therefore be used in the interpretation of results based on average flow reduction values.

Since inquiring minds want to know, please confirm whether or not a maximum diversion limit was included in the minimum flows analysis for the Lower Peace River and Shell Creek.

Also, if you wonder how the four three-month seasons were chosen for the HSM analysis (by me before I retired), attached is paragraph I suggested for Rubec's paper. The seasons were chosen to reflect not only changes in flows, but water temperature as well. BTW- I think it is fine you used a straight flow-based approach, and did not utilize the seasonal blocks.

Sid

FWRI File Code: F4204_14_F

Modeling to Assess Spatial Distributions and Population Numbers of Estuarine Species for Baseline and Minimum Flows in Lower Peace River, Shell Creek and Charlotte Harbor, Florida

Peter J. Rubec[1*], Christi Santi[2], Yonas Ghile[3], and Xinjian Chen[4]

Final Reporting Period: 12/01/14-12/31/17

1, 2-Florida Fish and Wildlife Conservation Commission, Fish and Wildlife Research Institute, 100 Eighth Ave. SE, St. Petersburg, Florida 33701, USA. Peter.Rubec@myfwc.com, Christi.Santi@myfwc.com.

3, 4-Southwest Florida Water Management District, 2379 Broad Street, Brooksville, Florida 34604, USA. Yonas.Ghile@swfwmd.state.fl.us, Xinjian.Chen@swfwmd.state.fl.us

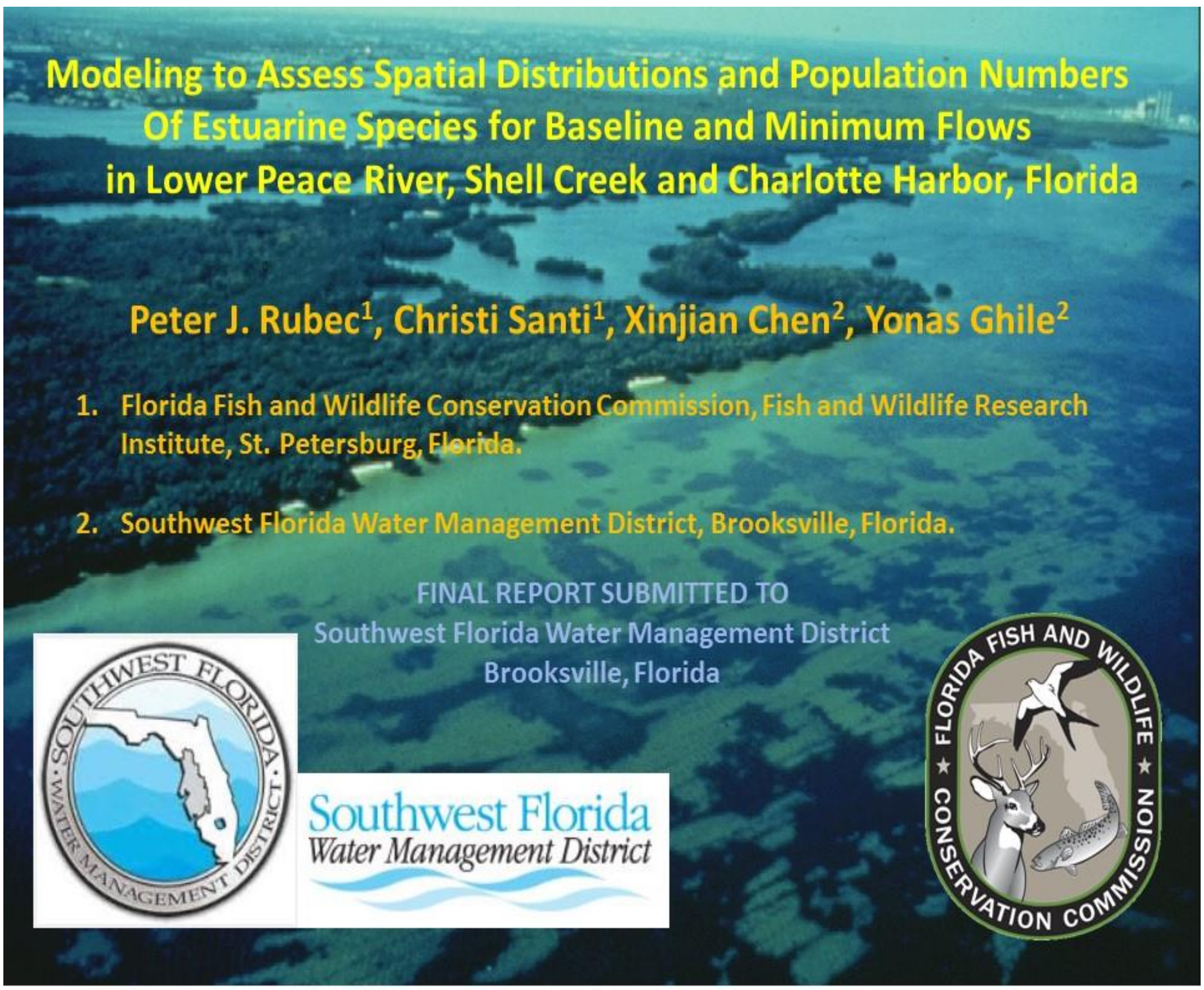


Table 1.	Seasonal mean Baseline Flows, mean Minimum Flows and percent flow reductions in Lower Peace River and Lower Shell Creek from 2007 to 2014.						
	Lower Peace River				Lower Shell Creek		
Season	Mean Baseline Flows (cfs)	Mean Minimum Flows (cfs)	Percent Flow Reduction		Mean Baseline Flows (cfs)	Mean Minimum Flows (cfs)	Percent Flow Reduction
Jan - Mar	276.64	203.06	26.60%		50.73	35.97	29.09%
Apr - Jun	362.81	245.04	32.46%		133.44	86.46	35.21%
Jul - Sep	1902.27	1179.92	37.97%		808.11	506.44	37.33%
Oct - Dec	536.42	361.35	32.64%		192.64	129.97	32.53%

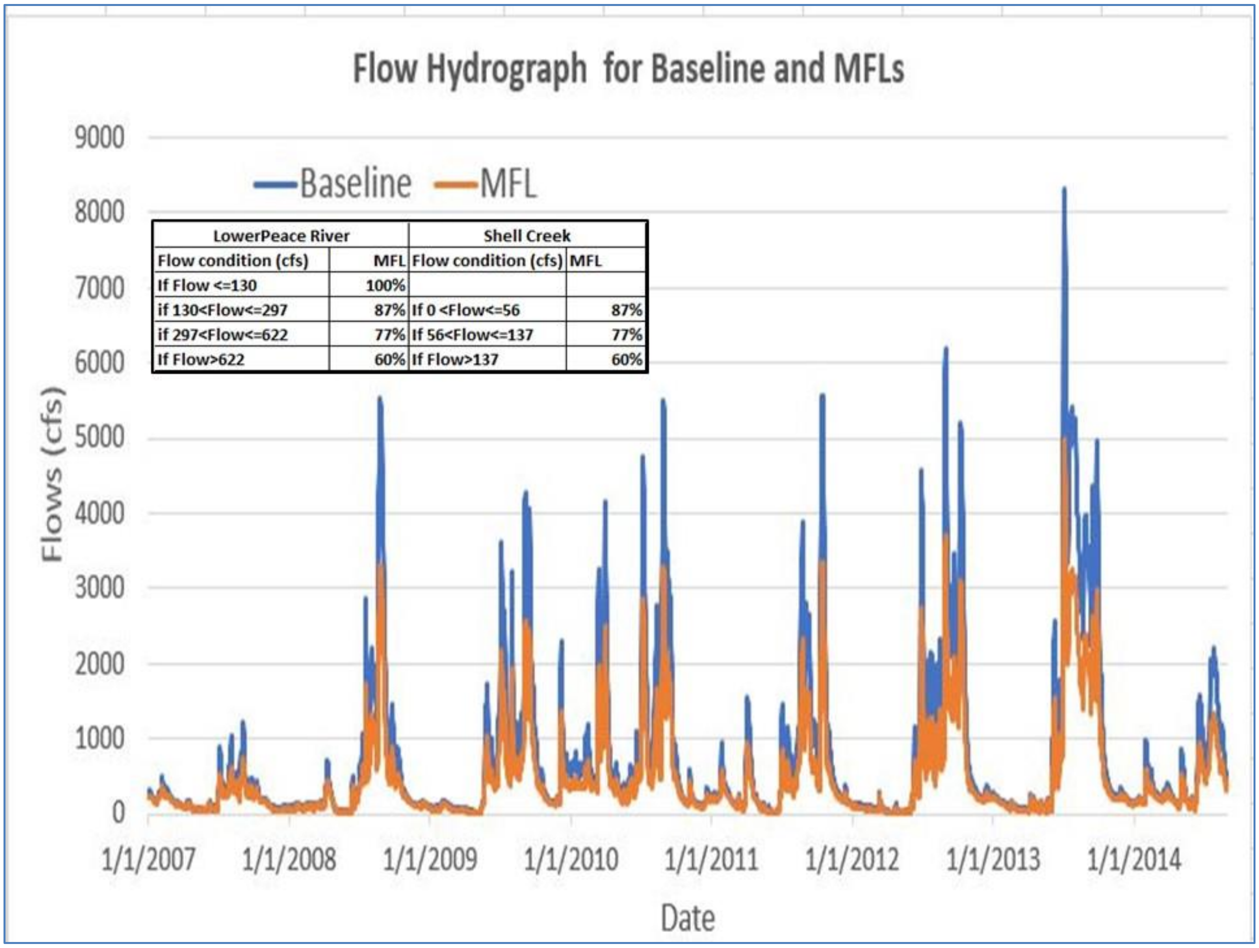


Figure 4. Flow hydrograph for Baseline and Minimum Flows conditions in the Lower Peace River. Ranges of flow conditions being used for water withdrawals are presented for the Lower Peace River and for Lower Shell Creek.

From:	Sid Flannery
To:	Sky Notestein; Doug Leeper; Yonas Ghile; Xinjian Chen
Subject:	follow-up point
Date:	Wednesday, December 05, 2018 7:00:07 AM

Hello guys,

A quick follow-up point from yesterday's email. I want to reiterate that I think it is fine, even preferable, to not include a maximum diversion limit in the minimum flow rule for the Peace River and Shell Creek. However, when reporting results, be cautious of how it skews average flow values. In all likelihood, extremely high diversions (e.g., > 1,500 cfs) will not be taken from the river.

The follow-up point is that not having a maximum diversion limit could possibly alleviate some controversies with potential upstream water users. However, as described in the report that I submitted in October, any new or increased withdrawals from the Peace River should be implemented as far downstream as possible with the water piped to upstream users if water from the river is truly necessary for their supply.

Sid

From:	Sid Flannery
To:	peterrubec@cs.com
Cc:	Doug Leeper; Xinjian Chen; Yonas Ghile
Subject:	Review of draft HSM minimum flows paper
Date:	Thursday, December 13, 2018 9:33:17 AM
Attachments:	Rubec Draft18 BL MF 9-22-18 Sid Edits.docx Sid comments on HSM paper to accompany track changes file.docx

Hello Peter,

Attached are my comments and suggested edits for your second HSM paper, which includes results generated from the draft minimum flows that are apparently to be proposed for the Lower Peace River and Shell Creek. I have copied Xinjian and Yonas as they are coauthors on the paper and Doug Leeper as he is the minimum flows program lead.

I have attached a version of the paper with my edits and comments in track changes. I have also attached another WORD file that gives some background for some of my suggestions. I expect some my suggested edits may have some grammatical errors or need improvement, so fix or reject at will.

I think the paper is very good and an excellent companion to the paper you recently submitted that was based on the FIM data. It is the District's call, but I think it is okay to present results generated from preliminary minimum flows. I think it is important to keep in mind the primary purpose of this paper is to highlight the use of Habitat Suitability Modeling (HSM), rather than justify the minimum flows. If the minimum flows change a bit during the adoption process I don't see that as a big deal.

Having said that, I do think some brief statements are needed in the paper that describes the percent-of-flow approach, which was used to generate the minimum flows. This is particularly relevant because the flow-based minimum percentages are listed in an inset in Figure 2.

Also, as my comments and edits describe, I think the average approach that was taken in this paper needs some qualification, as it does not capture the protective measures the percent-of-flow provides for much of the year. That is okay, but some qualification is needed especially if no significant harm is discussed.

Sid

Comments on HSM paper that compares results from baseline and minimum flow scenarios

Submitted by Sid Flannery

These comments accompany an edited copy of the paper in track changes. With regard to the points below, I may have missed some of these small edits in the test (e.g, SWFWMD vs. District). If you agree with such edits, please look for places where I may have missed them.

The most substantive of my comments is the last one listed. It is important to keep in mind this is primarily a HSM modeling paper, not a paper to justify the minimum flows. But, since the results are based on the proposed minimum flows, some brief mention of how the minimum flows work is needed in a couple of places. In particular, how the percent-of-flow approach works is needed, especially since the minimum flow percentages are listed in Figure 2.

As my last comment describes, I think the average approach that was taken to simulate salinity may overestimate the effects of the minimum flows since it includes the simulation of very large 40 percent withdrawals during high flows, which apparently were not constrained by a maximum withdrawal limit. Fortunately, as described later, this will have more effect on the average flows listed in Table 1 than on average salinity conditions that were derived from the hydrodynamic modeling. Having said that, some brief sentences should be included to mention how average conditions that were used in the HSM modeling may not fully capture the lower percentage withdrawal limits that are applied for much of the year, with smaller resulting effects. Some simple qualifying statements in this regard would help, especially since no significant harm is mentioned.

Comments

I would not use the term “District” in the paper and use SWFWMD consistently instead after the full agency name is used. I think I edited all of these in track changes but may have missed some.

District staff should determine how the proposed minimum flows are to be described as “proposed” or whatever. Is the District ready for these results to be published, as the minimum flows are not yet adopted? I suggest it is okay, as this is mainly a HSM paper and if the final minimum flows change from the proposed I don’t think it is no big deal for this paper or the District, but that is for you to decide.

Both the terms “inflow” or “inflows” can be appropriate depending on how it is used in the sentence. For example if inflows are being compared between seasons the plural is appropriate, but inflow is generally being referred to then the singular should be used. I made some edits in that regard but may have missed some.

Page 1. I don't think language that the proposed minimum flows will not cause significant harm language needs to be in the abstract. It can be described in the text, but with the caveat that the average approach may overestimate effects – more on that in last comment. Or, if significant harm mentioned in the abstract, put in a qualifier about the average approach, similar to what is in the discussion.

Page 2 – Review the separate reports by Peebles and Greenwood et al. to clarify the life stages of fish and invertebrates they reported significant relationships for. I think Peebles may have reported findings for some juvenile fishes, not just larval stages. Similarly, some of his invertebrates may have been adults. See comments in track changes document.

Page 5 – Note this is where I included language to describe the large differences in the average flows and that the percent of flow approach would require much smaller flow reduction percentages during much of the year. This is discussed again in my last comment.

Page 6 - I think it is important throughout the paper to insert the word "average" when referencing the salinity and temperature grids

Page 17 – I see where the existing minimum flow for the Lower Peace River was based on the volume of water less than 2 psu. What salinity zone did the District use for the proposed minimum flow? I think it is best to just keep this left unsaid and simply say low salinity water as the text now says.

Page 17 – this is where I think some discussion of significant harm is okay, as you can also mention how the average approach probably does not completely reflect the protection the percent-of-flow approach provides.

Final comment - What clued me off to this was Table 1 in the paper, which shows average flow reductions of about 32 percent in Oct-December and April-June. From Figure 2, it appears a maximum diversion capacity was not included in the minimum flow simulations. Thus, when 40% withdrawals are applied at flows over 622 cfs, very large (e.g., 2,000 to 3,000 cfs) flow reductions were simulated. These large withdrawals would exert a big effect on the average flow values for the minimum flow scenario. Table 1 but could be misleading as the daily percent flow reductions would well below the flow reductions indicated by the average values for prolonged periods of time. In that regard, the average approach taken in this project really does not fully capture the protective attributes of the percent-of-flow approach, but that is okay. As described in the text for pages 5 and 17, I have made these edits that I think cover this topic enough.

The good news in that Xinjian did not run model simulations for average flows, but instead provided to Peter daily salinity and temperature values for the full modeling period and then Peter generated average seasonal salinity and temperature values. The good news is that the average salinity values should not be as influenced as much by the large withdrawals as might be indicated by the large differences in the average flows. This is because salinity does not vary linearly with freshwater flow, as it is subject to greater changes at low flows with the rate of change flattening out at high flows. Also, salinity varies over a much smaller range than flow, thus the average salinity values will not be so susceptible to the large withdrawal effect as indicated by the average seasonal flow reductions.

All things considered, I don't think the average approach fully represents the protection provided by the percent-of-flow approach, as the reductions in average habitat areas and populations abundances presented in the paper and the corresponding District report overestimate the effects of the minimum flows to some extent. During much of the year, including critical times of estuarine nursery use, the withdrawal percentages and resulting effects will be much less. As described in previous comments for the text, I think I have made edits to the text that cover this sufficiently in the paper.

As stated before, I think I would keep the no significant harm discussion out of the abstract, but include it in the discussion where it can be more carefully qualified. Again, this is not a minimum flows paper, but is primarily intended to demonstrate the utility of the HSM approach. Or, if you want to put mention of no significant harm in the abstract, some qualifier about the average method needs to be included, similar to what is in the discussion.

From:	Doug Leeper
To:	Sid Flannery
Cc:	Yonas Ghile; Sky Notestein
Bcc:	Adrienne E. Vining; Chris A. Tumminia
Subject:	RE: Happy Tuesday - a few emails coming
Date:	Friday, December 14, 2018 11:23:00 AM

Sid:

Thanks for the input on Peter's work. Regarding your question, "(w)as a maximum diversion capacity utilized in the Lower Peace River and Shell Creek MFL analyses?"; the answer is yes.

I'm off to the motor city today and won't be back until next Wednesday.

If I don't hear from you or see you soon, have a great holiday season.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org

From: Sid Flannery <sidflannery22@gmail.com>
Sent: Tuesday, December 04, 2018 7:42 AM
To: Sky Notestein <Sky.Notestein@swfwmd.state.fl.us>; Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Happy Tuesday - a few emails coming

Hello Doug and Sky,

Later this morning I am going to send MFL staff three emails dealing with the subjects below. The staff who are working on those projects will be copied.

1. Was a maximum diversion capacity utilized in the Lower Peace River and Shell Creek MFL analyses. Fine if not, but will affect some results based on average flow values (i.e., Rubec's report).

2. I am willing to sample zooplankton one more time in Morris Bridge Sink.

3. Can Secchi disc or other water clarity data be incorporated in the Lower Hillsborough five-year MFL report.

I hope this is not too hard for Doug to deal with after the UGA Bulldogs suffered another defeat at the hands of the Crimson Tide. I played Crosby, Stills, Nash and Young's "Deja Vu" on WMNF on Monday in honor of that loss, which was eerily similar to last year. I was pulling for the Dawgs.

Sid

From:	Sid Flannery
To:	Doug Leeper
Cc:	Xinjian Chen; Yonas Ghile
Subject:	Have a great trip and Lower Peace follow-up
Date:	Friday, December 14, 2018 12:17:45 PM

Thanks Doug,

Have a great trip to the Motor City. Give my regards to the MC5 and also Mitch Ryder at the old folks home.

Regarding the maximum diversion capacity, you can fill me in when you get back on the size of it or Xinjian or Yonas can let me know what it was. I will get back with Peter and tell him my comments in his paper regarding the lack of diversion capacity is not correct. From his Figure 2 of baseline and minimum flows, it sure did not look like there was a diversion capacity. But, that the language can be corrected soon enough.

Happy Holiday, Merry Christmas, and stay out of jail,

Sid

On Fri, Dec 14, 2018 at 11:23 AM Doug Leeper <Doug.Leeper@swfwmd.state.fl.us> wrote:

> Sid:
>
> Thanks for the input on Peter's work. Regarding your question, "(w)as a maximum diversion capacity utilized in the Lower Peace River and Shell Creek MFL analyses?"; the answer is yes.
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> I'm off to the motor city today and won't be back until next Wednesday.
>
> If I don't hear from you or see you soon, have a great holiday season.
>
> Doug Leeper
>
> MFLs Program Lead
>
> Southwest Florida Water Management District
>
> Springs and Environmental Flows Section
>
> 2379 Broad Street, Brookville, FL 34604

1-800-423-1476, extension 4272 (FL only)

352-796-7211, extension 4272

doug.leeper@watermatters.org

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Sent: Tuesday, December 04, 2018 7:42 AM
To: Sky Notestein <Sky.Notestein@swfwmd.state.fl.us>; Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Happy Tuesday - a few emails coming

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Sid

From:	Sid Flannery
To:	Doug Leeper
Subject:	Please call at your convenience
Date:	Thursday, January 03, 2019 1:59:24 PM
Attachments:	COVER, TABLE 1 and FIGURE 4 - Rubec Peace Charlotte Harbor Fish Geographic Analysis.pdf

Hello Doug,

At your convenience, could you call me anytime over the next few days. I want to ask you a question about the Rubec Lower Peace project and then ask about the upcoming Rainbow River minimum flow rule a bit.

With regard to the Rubec work, I have included below excerpts and an attachment from an email I sent to you, Yonas, and Xinjian in early December.

Sid
813-245-0331

---------- Forwarded message ---------
From: **Sid Flannery** <sidflannery22@gmail.com>
Date: Tue, Dec 4, 2018 at 10:02 AM
Subject: Lower Peace River minimum flows
To: Sky Notestein <Sky.Notestein@swfwmd.state.fl.us>, Leeper Doug <doug.leeper@swfwmd.state.fl.us>, Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>, Xinjian Chen <xinjian.chen@swfwmd.state.fl.us>

(the excerpt below pertains to the inclusion, or not, of a maximum diversion limit in the Lower Peace River minimum flows analysis).

What brought this to mind is included in two pages from Rubec's report for the District. Attached is a file of the cover page, Table 1 and Figure 4 from that report. Table 1 shows the mean flow values for baseline and minimum flow conditions for the years 2007 to 2014. I was initially surprised to find that the minimum flows would allow a 32.5% reduction of the baseline flows during the three month season of April through June. The average withdrawals were least (26.6%) during the winter (January - March), but the 2007-2014 period was unusual for that three-month period had the lowest average baseline flows, which is not the typical seasonal pattern.

Figure 4 on page 3 of the attached file has an inset that lists the minimum flow percentages for different flow classes in the Lower Peace River and Shell Creek. It also shows a hydrograph of flows for baseline and minimum flow conditions for the Lower Peace River. This graph shows very large differences between these two flows when baseline flows are high, indicating that no maximum diversion limit was utilized. ***(you later said a maximum diverison limit was used, so I am wondering what was sent to Rubec)***

Sid

From:	Doug Leeper
To:	"Sid Flannery"
Bcc:	Yonas Ghile; Xinjian Chen; Sky Notestein; Randy Smith; Eric DeHaven; Adrienne E. Vining; Chris A. Tumminia
Subject:	RE: Please call at your convenience
Date:	Friday, January 04, 2019 4:05:00 PM

Sid:

Serendipitously (don't use this word too often), Yonas caught me between meetings yesterday and indicated that a 400 cfs cap was not included in the "reduced-from-unimpacted" flow record that was provided to Peter Rubec for his fish habitat analyses. So, what I indicated previously about inclusion of the flow-cap in the calculation of the reduced flow record that Peter used was in error.

Regarding the table (Table 1) from Peter's report that you referenced, I would note that our work to-date on identifying allowable percent-of-flow reductions has been flow-range based, not seasonally-based. It seems, however, that Peter compiled and averaged the flow records that we provided (unimpacted and reduced flows based on allowable flow-range-based percentages) by season (three month periods) to calculate percentage differences between the two records.

Doug Leeper
MFLs Program Lead
Southwest Florida Water Management District
Springs and Environmental Flows Section
2379 Broad Street, Brookville, FL 34604
1-800-423-1476, extension 4272 (FL only)
352-796-7211, extension 4272
doug.leeper@watermatters.org

From: Sid Flannery <sidflannery22@gmail.com>
Sent: Thursday, January 03, 2019 1:58 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Please call at your convenience

Hello Doug,

At your convenience, could you call me anytime over the next few days. I want to ask you a question about the Rubec Lower Peace project and then ask about the upcoming Rainbow River minimum flow rule a bit.

With regard to the Rubec work, I have included below excerpts and an attachment from an email I sent to you, Yonas, and Xinjian in early December.

Sid
813-245-0331

---------- Forwarded message ---------
From: **Sid Flannery** <sidflannery22@gmail.com>

Date: Tue, Dec 4, 2018 at 10:02 AM
Subject: Lower Peace River minimum flows
To: Sky Notestein <Sky.Notestein@swfwmd.state.fl.us>, Leeper Doug <doug.leeper@swfwmd.state.fl.us>, Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>, Xinjian Chen <xinjian.chen@swfwmd.state.fl.us>

(the excerpt below pertains to the inclusion, or not, of a maximum diversion limit in the Lower Peace River minimum flows analysis).

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Sid

From:	Sid Flannery
To:	Doug Leeper
Subject:	Re: Please call at your convenience
Date:	Friday, January 04, 2019 4:24:17 PM
Attachments:	New seasons paragraph.docx

Hi Doug,

Yep - that is what I figured on the Rubec results. So, they can be viewed as a worst case scenario - which might help the defense of the minimum flow.

I'm glad you are not using the seasonal blocks and are going straight flow-based. However, I thought it was important to look at seasonal effects in Rubec's work, so the four three-moth seasons were set up while I was there. The attached paragraph, which I suggested for Rubec's journal article, explains the rationale. It considers not just flows but also changes in water temperature. Goes back to some of the Ralph Montgomery and fish life cycle work.

I left you a voice mail, would still like to ask you about the timing of a permanent Rainbow minimum flow rule. Please call me sometime next week at your convenience.

Have a fine weekend.

Sid

On Fri, Jan 4, 2019 at 4:05 PM Doug Leeper <Doug.Leeper@swfwmd.state.fl.us> wrote:

> Sid:
>
> Serendipitously (don't use this word too often), Yonas caught me between meetings yesterday and indicated that a 400 cfs cap was not included in the "reduced-from-unimpacted" flow record that was provided to Peter Rubec for his fish habitat analyses. So, what I indicated previously about inclusion of the flow-cap in the calculation of the reduced flow record that Peter used was in error.
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Doug Leeper

MFLs Program Lead

Southwest Florida Water Management District

Springs and Environmental Flows Section

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doug.leeper@watermatters.org

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813-245-0331

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Date: Tue, Dec 4, 2018 at 10:02 AM
Subject: Lower Peace River minimum flows

To: Sky Notestein <Sky.Notestein@swfwmd.state.fl.us>, Leeper Doug <doug.leeper@swfwmd.state.fl.us>, Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>, Xinjian Chen <xinjian.chen@swfwmd.state.fl.us>

(the excerpt below pertains to the inclusion, or not, of a maximum diversion limit in the Lower Peace River minimum flows analysis).

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Sid

From:	Sid Flannery
To:	peterrubec@cs.com
Cc:	Doug Leeper; Yonas Ghile; Xinjian Chen; Sky Notestein
Subject:	Review of Habitat Suitability Modeling paper on Lower Peace River
Date:	Wednesday, January 09, 2019 10:07:09 AM
Attachments:	Rubec Draft19 BL MF 11-06-18 Sid Edits #2.docx Sid comments on HSM paper to accompany track changes file #2.docx

Hello Peter with cc to MFL staff,

Attached is my revised review of the draft paper you have prepared about the HSM modeling of the Lower Peace River/Charlotte Harbor system that simulated both baseline and minimum flow scenarios. My edits are very similar to the track changes version I sent to you on December 13th. I also attached a WORD file that describes my edits, which is also very similar to the comments I sent in December.

My few, new edits reflect the clarification that Doug recently sent to me, which specified that the final minimum flows for the Lower Peace River will include a maximum diversion limit. As I thought, Doug and Yonas also confirmed that your analyses did not include a maximum diversion limit for the simulated withdrawals.

That is okay, as long as that it is specified in the paper, which is reflected in my new edits. In that regard, the minimum flows presented in the paper should be referred to as "preliminary." I also inserted in the last paragraph of the paper a sentence that mentions the final minimum flows will likely include a maximum diversion limit.

I think this is all fine with the proper qualifiers. It is important to note this is primarily an HSM paper, and not a justification of the minimum flows. I think it is an excellent piece of work, but as the District's minimum flow process proceeds it can be made clear that these results, which are based on average conditions with no diversion limit, represent worst case conditions and the effects of actual implementation of the minimum flows will be less.

If you like, get back with me if you have any questions or comments about my review. Good work!

Sid

From:	Eric DeHaven
To:	Brian J. Armstrong; Karen West
Cc:	Jennette Seachrist; Chris A. Tumminia; April D. Breton; Yonas Ghile; Doug Leeper; Lei Yang; Cindy C. Rodriguez
Subject:	Draft letter from PRWC/PRMRWSA on Lower Peace MFL Max Day
Date:	Thursday, June 27, 2019 2:19:54 PM
Attachments:	LPR Max Day Letter.pdf

Attached is a draft letter that the PRWC and PRMRWSA shared at the Peace River Coordination Committee Meeting that was held today. This letter will be going to their respective Boards in July for approval to send to the District. The letter is a result of the settlement agreement between the two water supply entities.

District MFL staff are actively reviewing the 400 CFS Max Day quantity as a part of the Lower Peace River MFL re-evaluation and the PRWC Peace River/Land Use Transition Project (Q133).

Eric DeHaven, P.G.
Southwest Florida Water Management District
Assistant Director, Resource Management Division
7601 HWY 301N Tampa FL 33637
(813) 985-7481 X2118

DRAFT

June 25, 2019

Via U.S. Mail and Email

Eric DeHaven, P.G., Assistant Director
Resource Management Division
Southwest Florida Water
Management District
7601 U.S. Highway 301 North
Tampa, FL 33637
Eric.DeHaven@swfwmd.state.fl.us

Re: **Request to Consider Change to MFL Maximum Day Withdrawal in Rule 40D-8.041(8)(c), F.A.C.**

Dear Mr. DeHaven,

We understand the Southwest Florida Water Management District ("District") is currently in the process of re-evaluating the minimum flows and levels ("MFL") for the Upper, Middle and Lower Peace Rivers. The Peace River/Manasota Regional Water Supply Authority ("Authority") and the Polk Regional Water Cooperative ("Cooperative") both agree that the Peace River is a vital resource within their respective territorial boundaries and are committed to working together to protect the Peace River and its tributaries so that they can provide a clean and abundant water supply for the future. We would like to jointly request the opportunity to participate in this process to ensure that our common interests are protected.

In addition, the Authority and Cooperative would specifically request that the District consider increasing the 400 cfs MFL maximum day withdrawal quantity in Rule 40D-8.041(8)(c), F.A.C. As you are aware, the current rule limits withdrawals from the Peace River to a maximum rate of 400 cfs. We understand this 400 cfs limit was developed by Dr. Marty Kelly back in 2010, when the MFL for the Lower Peace River was first adopted and is based on then projected withdrawals from the river. Those projections were developed more than 10 years ago and much has changed in terms of future plans for the use of the Peace River. We would like the opportunity to sit down with you and your staff to explore alternatives to this current number that better reflects the future use of the Peace River, while still protecting the water resources and the ecology of the area from significant harm.

We look forward to working with you and your staff regarding this important effort and will be contacting you in the near term to set up a technical meeting. In the meantime, if you have any questions, please feel free to contact us.

Sincerely,

Peace River/Manasota Regional Water Supply Authority

Patrick J. Lehman, P.E.
Executive Director

Polk Regional Water Cooperative

Ryan J. Taylor
Executive Director

cc: Brian Armstrong, SWFWMD
Karen West, Esq., SWFWMD
Michael Coates, PRMRWSA
Gene Heath, PRMRWSA
Douglas P. Manson, Esq.
Edward P. de la Parte, Jr., Esq.
Michael Craig, Esq.
Sean Parker, Esq.
Thomas A. Cloud, Esq.
Timothy McCausland, Esq.
Frederick J. Murphy, Jr., Esq.

June 25, 2019

Via U.S. Mail and Email

Eric DeHaven, P.G., Assistant Director
Resource Management Division
Southwest Florida Water
Management District
7601 U.S. Highway 301 North
Tampa, FL 33637
Eric.DeHaven@swfwmd.state.fl.us

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Polk Regional Water Cooperative

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Edward P. de la Parte, Jr., Esq.
Michael Craig, Esq.
Sean Parker, Esq.
Thomas A. Cloud, Esq.
Timothy McCausland, Esq.
Frederick J. Murphy, Jr., Esq.

From: Sid Flannery
To: Lei Yang
Cc: Doug Leeper; Danielle Rogers; Jordan D. Miller
Subject: Peace River Report
Date: Friday, February 14, 2020 7:04:08 AM
Attachments: Report - Watershed Based Approach, Withdrawal Sites, Peace and Alafia Rivers, M.S. Flannery Oct 1, 2018.pdf

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Hello Lei with cc's to Doug, Danielle and Jordan,

It was great visiting with you Lei when I stopped by the District Brooksville office last month. I think it is really great that you are now working on minimum flows, including projects to restore some flow in the Upper Peace River.

I am sending you and others a report I put together about the Peace and Alafia Rivers back in October 2018.   While at the District, I worked on both the Peace and Alafia and have continued to have a big picture interest in both.   I decided to write the attached report when a couple of years ago there was an issue in which the Polk Regional Water Cooperative (PRWC) was planning to challenge the renewal of the water use permit for the Peace River Manasota Regional Water Supply Authority (PRMRSA), whose intake is located near Ft. Ogden about 19 miles upstream of the river mouth at Charlotte Harbor.   To give themselves "standing," the PRWC had also filed water use permit applications to withdraw water from either the Upper Peace River, the Peace Creek Canal, or the North and South Prongs of the Alafia.

Well I thought that is a bad idea, so I decided to write a report that summarizes the hydrology of the Peace River, with a shorter section about the Alafia. My report describes human influences on flows and updates flow trends and area-based runoff values up to current, which was through calendar year 2017 at that time. Fortunately, the PRWC and the PRMRWSA settled and there was no challenge to the permit nor any new permit applications, but they did form some sort of group to address issues on the Peace River in the coming years.

Anyway, I think my report provides a nice overview of the hydrology of the Peace River in relation to minimum flows, with a bit less information on the Alafia.

Best Regards,

Sid

Southwest Florida
Water Management District

2379 Broad Street, Brooksville, Florida 34604-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
WaterMatters.org

An Equal Opportunity Employer

Bartow Office
170 Century Boulevard
Bartow, Florida 33830-7700
(863) 534-1448 or
1-800-492-7862 (FL only)

Sarasota Office
6750 Fruitville Road
Sarasota, Florida 34240-9711
(941) 377-3722 or
1-800-320-3503 (FL only)

Tampa Office
7601 U.S. 301 North (Fort King Highway)
Tampa, Florida 33637-6759
(813) 985-7481 or
1-800-836-0797 (FL only)

March 6, 2020

Pat Lehman, P.E.
Executive Director
Peace River/Manasota Regional
Water Supply Authority

Ryan Taylor
Executive Director
Polk Regional Water Cooperative

Subject: Request to Consider Change to MFL Maximum Day Withdrawal in Rule 40D-8.041(8)(c), F.A.C. – Letter Dated June 25, 2019

Dear Mr. Lehman and Mr. Taylor:

Thank you for your letter regarding the Lower Peace River Minimum Flows and the established 400 cfs maximum day withdrawal quantity. As you mentioned, District staff are in the process of re-evaluating the Lower Peace River Minimum Flows. The re-evaluation process has included review of the 400 cfs maximum day withdrawal quantity. We would like to discuss the full minimum flows re-revaluation with you this month as we begin stakeholder outreach and peer review for the new, proposed Minimum Flows.

Regarding the maximum day quantity, the District intends to continue using 400 cfs as a maximum day limit for withdrawals from the Lower Peace River (that portion of the river below the USGS Peace River at Arcadia gage #02296750). The current PRMRWSA permit also includes a maximum day withdrawal limit of 400 cfs. It is important to note that withdrawals from portions of the Peace River upstream of the Lower Peace River do not impact the maximum day quantity associated with the PRMRWSA permit. The District has not established a maximum day withdrawal limit for the upstream portions of the Peace River. We anticipate that a maximum day withdrawal limit may be defined when we complete a re-evaluation of the Upper Peace River Minimum Flows in 2025 (as currently scheduled in the District's Minimum Flows and Levels Priority List and Schedule). If such a limit is defined, we anticipate that it would be set for a specific segment of the Peace River. In addition, if a permit application is received for withdrawals on the Upper Peace River the District will review that application pursuant to the requirements in Chapter 40D-2, F.A.C., including the need for a maximum day quantity.

Should you have any questions, please contact me at (813) 985-7481 extension 2118 or by email at Eric.DeHaven@swfwmd.state.fl.us.

Sincerely,

Eric C. DeHaven, P.G.
Assistant Director, Resource Management Division
Southwest Florida Water Management District

Cc: Michael Coates, PRMRWSA
Gene Heath, PRWC
Douglas Manson, Esq.
Edward de la Parte, Esq.

From: Laura Baumberger
To: Yonas Ghile; Sarah Burns
Cc: Steve Adams; Tom Jackson; Doug Leeper; Chris Zajac; Eric DeHaven; Randy Smith
Subject: RE: Lower Shell Creek MFL model
Date: Wednesday, March 11, 2020 4:41:21 PM

Thank you, Yonas.

Could you also provide the slides that you presented on Monday?

Regards,
Laura

Laura Baumberger, PE
Project Manager | Vice President
301 North Cattlemen Road, Suite 302 | Sarasota, FL 34243
P 941-371-9832 | **M** 941-400-2320
carollo.com

From: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>
Sent: Wednesday, March 11, 2020 12:43 PM
To: Sarah Burns <sburns@carollo.com>
Cc: Laura Baumberger <LBaumberger@carollo.com>; Steve Adams <SAdams@cityofpuntagordafl.com>; Tom Jackson <TJackson@cityofpuntagordafl.com>; Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>; Chris Zajac <Chris.Zajac@swfwmd.state.fl.us>; Eric DeHaven <Eric.Dehaven@swfwmd.state.fl.us>; Randy Smith <Randy.Smith@swfwmd.state.fl.us>
Subject: RE: Lower Shell Creek MFL model

Hi Sarah and Laura

Per your request, attached is the baseline flow reconstructed by HSW from 1966- 2016 for the Shell Creek watershed. I have extended the near Punta Gorda baseline flows to 2018 for the reservoir analysis. Column F under the worksheet “ Shell_PG”, was used for the reservoir analysis. There are about 435 days with 0 reported flows and their inflows were filled using regressions developed with either Prairie Creek or Charlie Creek flows. Please let me know, if you have any question.

Thanks
Yonas

From: Sarah Burns <sburns@carollo.com>
Sent: Wednesday, January 15, 2020 9:37 AM
To: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>

Cc: Laura Baumberger <LBaumberger@carollo.com>
Subject: Lower Shell Creek MFL model

Good morning Yonas,

Could you provide me with the Lower Shell Creek MFL model? Do you have any instruction material related to the model that you would like to share as well?

Thanks!
Sarah

Sarah Burns, P.E.
Project Engineer
10117 Princess Palm Avenue, Suite 340 | Tampa, FL 33610
P 813-906-4604 | **M** 978-855-2545
carollo.com

From:	Yonas Ghile
To:	Laura Baumberger; Sarah Burns
Cc:	Steve Adams; Tom Jackson; Doug Leeper; Chris Zajac; Eric DeHaven; Randy Smith
Subject:	RE: Lower Shell Creek MFL model
Date:	Thursday, March 12, 2020 1:46:42 PM
Attachments:	Shell Creek MFL_March 09_2020.pptx

Hi Laura

Attached is the slides of my presentation.

Thank you

From: Laura Baumberger <LBaumberger@carollo.com>
Sent: Wednesday, March 11, 2020 4:41 PM
To: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>; Sarah Burns <sburns@carollo.com>
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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Proposed Minimum Flows for Lower Shell Creek

Southwest Florida Water Management District

City of Punta Gorda, Florida
March 09, 2020

1

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Draft Schedule

Major Activities	Schedule
Draft MFLs report developed	Under internal review
Draft recovery strategy report developed	Submitted to City of PG for review
Water budget model developed	Submitted to City of PG for review
Presentation to City of Punta Gorda	March 09, 2020
Submit and file to Governing Board - MFLs report	March 24, 2020
Stakeholders and peer review of MFLs report	Mar 25 - Jun 26, 2020
Statement of estimated regulatory cost (SERC)	July 15 , 2020
Public workshop	July 15 - 30, 2020
Presentation to Governing Board (MFLs report, recovery strategy, SERC and rules)	September 2020

2

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Background: Lower Shell Creek Minimum Flows

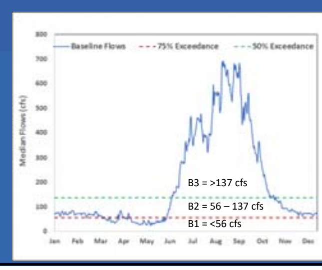
- Draft minimum flows developed in 2010
- However, adoption scheduled for 2020 to incorporate additional studies
- Lower Shell Creek is defined as the segment from the Hendrickson Dam to the confluence of Shell Creek with the Lower Peace River
- Lower Shell Creek and Lower Peace River modeled as one system

3

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Approach for Minimum Flows Development

- Developed baseline flows for Lower Shell Creek (flows with no withdrawals) for 1966-2018.
- Identified three flow-based blocks.



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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Ecological Criteria and Models used

Ecological Resources	Model	Metrics
1. Salinity-based habitats	Hydrodynamic model	Shoreline, river bottom area and water volume associated with <2, <5, <10, <15, <20 psu zones
2. Floodplain wetlands (Lower Peace River)	Hydrodynamic model & GeoRAS	Area of inundations, water levels
3. Habitats for 8 fish species and Blue Crab	Hydrodynamic model & non-linear regression models	Habitat suitability zones: low, moderate, high and optimum
4. Water quality	Non-linear regression models	Levels of dissolved oxygen, nutrients, chlorophyll, color

- **< 2 psu salinity volume** was the most sensitive metric to flow reduction scenarios
- Minimum flows developed based on preserving 85% of **< 2 psu salinity volume**

5

5

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

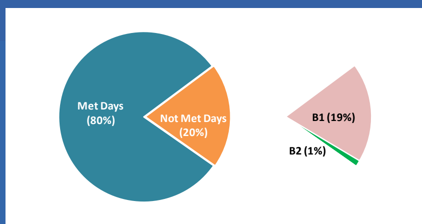
Proposed Minimum Flows for Lower Shell Creek

	Low Flow (B1)	Medium Flow (B2)	High Flow (B3)
Flow (cfs)	<=56	>56 - 137	> 137
Allowable withdrawals (%)	13%	23%	40%

6

Minimum flow Status - Lower Shell Creek

- Proposed minimum flows for low flow blocks are not met
- A recovery strategy would need to be adopted along with adoption of the minimum flows



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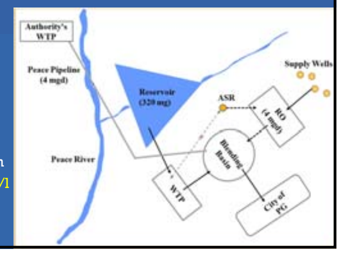
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Impact Analyses Modeling (1972-2018)

- Source for minimum flows
  - Shell Creek
- Sources of water supply, in order:
  - Reservoir (~ 320 mg)
  - RO (4 mgd)
  - Peace Pipeline(4 mgd)
  - ASR (discontinued)
- Seepage through the dam
  - (0.4-0.6 mgd)
- City's demand projections
  - 2020 (5.4 mgd)
  - 2040 (6.3 mgd)
- TDS limit at the blending basin
  - Emergency rule ≤ 1000 mg/l
  - DEP rule ≤ 500 mg/l



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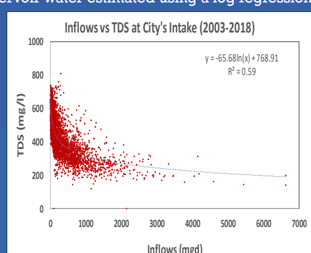
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

TDS Estimation

- TDS of reservoir water estimated using a log regression



- RO efficiency is assumed to be 95%
- TDS of RO water = 5% of GW TDS (1782 mg/l) = 89 mg/l

9

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Reservoir Reliability Assessment

- Reservoir Reliability is the probability that the reservoir will satisfy the water demand at a specified period of evaluation (1972 -2018).

$$\text{Reiliability} = \frac{\text{Demand met days}}{\text{Total days in the evaluation period}} \times 100$$

10

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Impacts of Proposed Minimum Flows to City of Punta Gorda Water Supply Reliability

- Impacts of DEP TDS limit (36.6%)
- RO improves reliability by 36.8%

Sc.	Source of Water	2040 Demand Projection	DEP TDS Limit	Minimum Flows	Water Supply 100% Met Days	Minimum Flows Met Days
1	Reservoir	6.3 mgd	1000 mg/l	No	99.71%	80.00%
2	Reservoir	6.3 mgd	500 mg/l	No	62.21%	80.00%
3	Reservoir & RO	6.3 mgd	500 mg/l	No	100.00%	80.00%
4	Reservoir & RO	6.3 mgd	500 mg/l	Yes*	97.38%	100.00%
5	Reservoir & RO & PP	6.3 mgd	500 mg/l	Yes*	100.00%	100.00%

- Impacts of Minimum flows (2.6%)

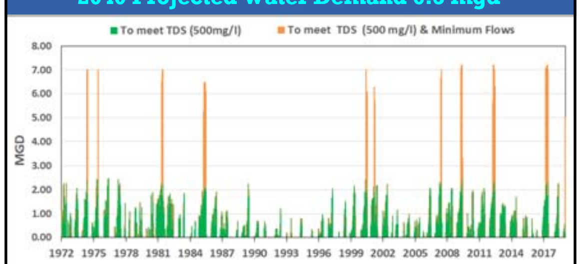
* A bypass project (recovery strategy) is needed for minimum flows

- PRMRWSA Pipeline (PP) is needed for 100% water supply reliability
- PP may not be needed if RO is expanded to 8 mgd

11

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Daily Water Needs from RO and PP Under the 2040 Projected Water Demand 6.3 mgd



Water Needs for	0 mgd	0 – 2 mgd	2 - 4 mgd	4 -6 mgd	6 – 7.2 mgd
TDS (500 mg/l)	63%	36%	1%	0%	0%
TDS (500 mg/l) and Minimum Flows	63%	34%	1%	1%	2%

12

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Summary of the Proposed Minimum Flows

- Proposed Lower Shell Creek minimum flows are based on maintaining 85% of the 2 psu salinity habitat
- Proposed minimum flows for Lower Shell Creek are currently not met, and a recovery strategy is required
- Proposed recovery strategy include:
  - Use of RO/ PP for water supply when reservoir water is not enough to meet demands after meeting minimum flows
  - Dam bypass facility
    - Spillway outlet option
    - Low-level gated conduit option
    - Pump station option
  - Modification of water use permit

13

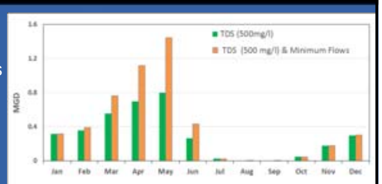
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Thank you

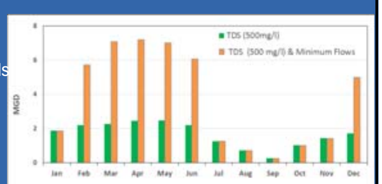
14

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Monthly average water needs from RO and PP by 2040
(Water demand = 6.3 mgd)



Monthly average water needs from RO and PP by 2040
(Water demand = 6.3 mgd)



15

Item 29

RESOURCE MANAGEMENT COMMITTEE

March 24, 2020

Submit and File Report

Proposed Minimum Flows for Lower Peace River and Lower Shell Creek Prior to Independent Scientific Peer Review

Purpose
To provide, for information only: 1) proposed minimum flows for the Lower Peace River and Lower Shell Creek; 2) summarize the methods used to develop the proposed minimum flows; and 3) provide an update on plans for peer review and opportunities for stakeholder input on the proposed minimum flows.

Background/History
Minimum flows for the Lower Peace River were adopted (Rule 40D-8.041(8), F.A.C.) in July 2010 and became effective in August 2010. The minimum flow rule provision includes a low flow threshold that is applicable throughout the year and seasonally dependent (i.e., block-specific) minimum flows that specify allowable percentage-based flow reductions. The rule also limits permitted maximum withdrawals from the Lower Peace River on any day to 400 cubic feet per second (cfs).

Reevaluation of the currently adopted minimum flows for the Lower Peace River and development of new minimum flows for Lower Shell Creek are scheduled for 2020 on the District's Minimum Flows and Levels Priority List and Schedule.

Purpose/Approach
The purpose for establishing minimum flows is to identify limits beyond which further withdrawals would be significantly harmful to the water resources or ecology of the areas. District staff has completed a comprehensive reevaluation of the minimum flows established for the Lower Peace River and developed new, recommended minimum flows for the Lower Peace River and Lower Shell Creek. These recommended minimum flows were developed using the best information available, as required by the Florida Statutes, and were based on all relevant environmental values identified in the Florida Water Resource Implementation Rule for consideration when setting minimum flows.

For the comprehensive minimum flows analyses, the Lower Peace River and Lower Shell Creek were modeled as a single system to appropriately characterize the strong hydrologic interactions between the river, creek and Charlotte Harbor. For modeling efforts, the District re-mapped the bathymetry of the Lower Peace/Shell System and upper Charlotte Harbor estuary, produced a LiDAR-based high resolution digital elevation model for the area, developed and used a refined hydrodynamic model to predict salinity, water level and temperature in the Lower Peace/Shell System and Charlotte Harbor, and extended its application to floodplain areas of the Lower Peace River. In addition, habitat modeling for a number of estuarine-dependent fish species and Blue Crab, water quality assessments, and floodplain inundation analysis for the upper portion of the Lower Peace River were conducted to support minimum flows development for the Lower Peace River and Shell Creek.

Among the various factors assessed for the Lower Peace/Shell System, the most sensitive criterion was low-salinity (< 2 practical salinity units or psu) habitat. Potential flow-related changes in this sensitive habitat were modeled and used to develop minimum flow recommendations for the Lower Peace River and Lower Shell Creek that are expected to maintain 85% of the low-salinity habitat.

The recommended minimum flows for both systems allow for potential reductions of 13% of daily flow under low-flow conditions (Block 1), 23% of the daily flow under moderate-flow conditions (Block 2), and 40% of daily flow under high-flow conditions (Block 3). For the Lower Peace River, the recommended minimum flows also includes a low flow threshold of 130 cfs and a maximum daily withdrawal limit of 400 cfs that are applicable regardless of flow conditions. For the Lower Peace River, the daily flows used for identifying allowable flow reductions are based on the combined flow at the U.S. Geological Survey (USGS) Peace River at Arcadia, Horse Creek near Arcadia and Joshua Creek at Nocatee gages. For Lower Shell Creek, the minimum flows are based on inflows to Shell Creek Reservoir estimated based on outflow from the reservoir at the USGS Shell Creek near Punta Gorda gage, reservoir storage and permitted withdrawals from the reservoir.

Status assessments based on the best available information indicate the recommended minimum flows for the Lower Peace River are being met and are expected to be met over the next 20 years. However, modeling results based on historical records indicate the proposed minimum flows for Lower Shell Creek would not have been met approximately 20% of time during a long-term simulation. Based on this assessment, flows in Lower Shell Creek are currently below the minimum flows recommended for the creek. Development, concurrent adoption, and expeditious implementation of a recovery strategy would, therefore, be necessary for adoption of the proposed minimum flows for Lower Shell Creek. Staff has developed a preliminary, draft recovery strategy for Lower Shell Creek that will support achievement of the proposed minimum flows and will be working with the City of Punta Gorda in the coming months on development of a final, draft recovery strategy report for consideration by the Governing Board.

The data, methods and models used to support development of the proposed minimum flows are summarized in a technical report “Proposed Minimum Flows for the Lower Peace and Lower Shell Creek, Draft Report” which is provided under separate cover.

Benefits/Costs
The recommended minimum flows were developed to ensure that the natural and human-use environmental values associated with the Lower Peace River and Lower Shell Creek are protected from significant harm that could result from consumptive water use.

The next step toward establishing the minimum flows involves peer review of the recommended minimum flows by an independent scientific panel. The review will be facilitated by the District in accordance with Florida’s Government-in-the-Sunshine Law and include opportunities for stakeholder input on the review process. Findings from the peer review will be provided to the Governing Board at a future meeting. Subsequent to the peer review, public workshops will be facilitated to seek additional stakeholder input on the proposed minimum flows for the Lower Peace River and Lower Shell Creek, and the recovery strategy for Lower Shell Creek. Following staff consideration of the peer review findings and stakeholder input, staff will return to the Board with findings from the peer review, stakeholder input, final minimum flows and recovery strategy reports, and proposed rule language to establish minimum flows for the Lower Peace River and Lower Shell Creek and a recovery strategy for Lower Shell Creek.

Staff Recommendation:

This item is for the Board's information only, and no action is required.

Presenter: Yonas Ghile, Lead Hydrologist, Environmental Flows and Assessments Section

MINUTES OF THE MEETING

GOVERNING BOARD
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

BROOKSVILLE, FLORIDA MARCH 24, 2020

Due to the COVID-19 virus, this meeting was held through electronic media to reduce public gatherings and practice social distancing.

The Governing Board of the Southwest Florida Water Management District (District) met for its regular meeting at 10:00 a.m., on March 24, 2020, at its Brooksville Office, 2379 Broad Street, Brooksville, Florida. The following persons were present:

Board Members Present	Staff Members
Mark Taylor, Chair	Brian J. Armstrong, Executive Director
Michelle Williamson, Vice Chair *via Phone	Amanda Rice, Assistant Executive Director
Joel Schleicher, Secretary *via Phone	Karen E. West, General Counsel
Rebecca Smith, Ph.D., Member *via phone	John J. Campbell, Division Director
James G. Murphy, Member *via Phone	Brian Starford, Division Director
Roger Germann, Member *via Phone	Michael Molligan, Division Director
Jack Bispham, Member *via Phone	Jennette Seachrist, Division Director
Seth Weightman, Member*via phone	Michelle Hopkins, Division Director
Board Members Absent	**Board Administrative Support**
Kelly S. Rice, Treasurer	Lori Manuel, Administrative Coordinator

Approved minutes from previous meetings can be found on the District's website (www.WaterMatters.org).

PUBLIC HEARING (00:00)

1. **Call to Order**
   Chair Mark Taylor called the meeting to order and opened the public hearing.

2. **Invocation and Pledge of Allegiance**
   Chair Taylor offered the invocation and led the Pledge of Allegiance.

Chair Taylor introduced each member of the Governing Board, who attended remotely. He noted that the Board meeting was being recorded for broadcast on government access channels, and public input was only taken during the meeting via telephone communication.

Chair Taylor provided a telephone number to any member of the public wishing to address the Governing Board concerning any item listed on the agenda or any item that does not appear on the agenda. Chair Taylor stated that comments would be limited to three minutes per speaker, and, when appropriate, exceptions to the three-minute limit may be granted by the chair. He also requested that several individuals wishing to speak on the same issue/topic designate a spokesperson.

At this time, the meeting was recessed to receive the names of any members of the public who wanted to provide input via telephone. Audio: (00:04:50)

Chair Taylor reconvened the meeting at 10:14 a.m.

Ms. Lori Manuel called roll and stated a quorum was present.

Chair Taylor stated that the following agenda items were moved to the Consent Agenda. He stated that due to physical constraints imposed on other Board members, it was agreed that he would chair the various committees.

3. **Recognition and Resolution No. 20-02, Commending John Henslick for His Service as a Member of the Southwest Florida Water Management District Governing Board**

20. **Fiscal Year 2018-19 Comprehensive Annual Financial Report**

33. **Offer for Surplus Lands – Cypress Creek Preserve (CC-1), SWF Parcel No. 13-500-396S**

34. **Offer for Surplus Lands – GUM Slough 1 (Gum-1), SWF Parcel No. 19-193-114S**

~~3. **Recognition and Resolution No. 20-02, Commending John Henslick for His Service as a Member of the Southwest Florida Water Management District Governing Board**~~

~~4. **Employee Recognition**~~
~~Chair Taylor recognized employees who have reached at least 20 years of service with the District and thanked them. The following staff were recognized: Mike Bartlett and Terry Burrell.~~

5. **Additions/Deletions to Agenda**
Mr. Brian Armstrong, Executive director, stated the following items were deleted from the agenda:

4. **Employee Recognition**

17. **Administrative, Enforcement and Litigation Activities that Require Governing Board Approval**
    c. **Authorization to Issue Administrative Complaint and Order – Permit Condition Violations – Walden Pointe Homeowners Association, Inc. – ERP No. 44030339.000 – CT No. 404674 – Hillsborough County**
    d. **Consideration of Final Order – Petition for Declaratory Statement – Shannon R. Turbeville – Hernando County**
    e. **Authorization to Issue Administrative Complaint and Order – Well Construction Violations – Mark James – License Number 11031 – CT Nos. 406326 & 406331 – Hillsborough County**

27. **Peace River Manasota Regional Water Supply Authority Update**

35. **Conveyance of Fee Interest for the Ridge Road Right of Way, Pasco County, FL, SWF Parcel Numbers 15-705-107S and 15-705-108P**

Secretary Joel Schleicher requested the following items be moved to Discussion:

Resource Management

9. **Modification of the Repayment of Funds for Lake Jackson Watershed Hydrology Investigation Project (N554)**

10. **Anna Maria North Island BMPs Phases H and J - Scope Change (W215)**

11. **FARMS – Tippen Bay Properties, LLLP – Doe Hill Citrus Phase 3 (H781), DeSoto County**

6. **Public Input for Issues Not Listed on the Published Agenda**
No requests were submitted.

Chair Taylor stated there was good cause to approve the amended agenda as allowed by Section 120.525, Florida Statutes. (00:11:05)

Consent Agenda

3. **Recognition and Resolution No. 20-02, Commending John Henslick for His Service as a Member of the Southwest Florida Water Management District Governing Board**

Finance/Outreach & Planning Committee

7. **Budget Transfer Report**
   Staff recommended Board approval of the Budget Transfer Report covering all budget transfers for February 2020.

8. **Springs Protection Awareness Month Resolution**
   Staff recommended the Board approve and execute Resolution No. 20-01 declaring April 2020 as "Springs Protection Awareness Month."

20. **Fiscal Year 2018-19 Comprehensive Annual Financial Report**
   Staff recommended the Board accept and place on file the District's Comprehensive Annual Financial Report, including a Single Audit pursuant to Chapter 10.550, Rules of the Auditor General, the Management Letter and the Independent Accountants' Report for fiscal year ended September 30, 2019.

Resource Management

~~9. **Modification of the Repayment of Funds for Lake Jackson Watershed Hydrology Investigation Project (N554)**~~
   ~~Staff recommended the Board approve waiving Highlands County's obligation to repay District costs of $28,218.30 for the Lake Jackson Hydrology Investigation Project, Cooperative Funding Initiative project N554.~~

~~10. **Anna Maria North Island BMPs Phases H and J - Scope Change (W215)**~~
   ~~Staff recommended the Board approve the scope revision to decrease the TSS removal from 63,582 lbs./yr. to 15,800 lbs./yr. and reduce the TN removal from 1,468 lbs./yr. to 352 lbs./yr., which are the resource benefits in the cooperative funding agreement.~~

~~11. **FARMS – Tippen Bay Properties, LLLP – Doe Hill Citrus Phase 3 (H781), DeSoto County**~~
   ~~Staff recommended:~~
   ~~1) Approve the Tippen Bay Properties, LLLP project for a not-to-exceed reimbursement of $42,000, with $42,000 provided by the Governing Board;~~
   ~~2) Authorize the transfer of $42,000 from fund 010 H017 Governing Board FARMS fund to the H781 Tippen Bay Properties, LLLP project fund; and~~
   ~~3) Authorize the division director to sign the agreement.~~

Operations, Lands and Resource Monitoring Committee

12. **Release and Acceptance of Conservation Easements Between the District, Hillsborough County and Lennar Homes for the Apollo Beach Boulevard Extension Project, SWF Parcels 11-118-145S and 11-118-146P**
   Staff recommended:
   - Accept the offer of a 5.921-acre conservation easement and $225,000;
   - Approve and authorize the Chairman and Secretary of the Governing Board to execute the First Amendment to Conservation Easement;
   - Approve and authorize the Chairman and Secretary of the Governing Board to execute the Partial Release of Conservation Easement and Quit Claim;
   - Approve the Agreement for Release of Easement with Hillsborough County and authorize the Executive Director to sign on behalf of the District after all other contingencies

- required by the First Amendment to the Conservation Easement have been satisfied; and
- Authorize staff to execute any other documents necessary to complete the transaction in accordance with the approved terms.

13. Purchase and Sale Agreement Between the District and Hillsborough County for Maydell Drive Bridge Replacement, SWF Parcel Numbers 13-001-749S and 13-001-750P Regulation Committee

Staff recommended:

- Accept the offer of $108,094 for the additional 150-feet of right of way (approx. 2.48 acres) needed for the Maydell Drive Bridge replacement;
- Approve the Purchase Agreement and authorize the Executive Director to sign on the behalf of the District;
- Authorize the Chairman and Secretary of the Governing Board to execute the Quit Claim Deed;
- Authorize the conveyance of the District's interest in all phosphate, minerals, metals and petroleum in or on or under the land upon the request of the buyer; and
- Authorize staff to execute any other documents necessary to complete the transaction in accordance with the approved terms.

14. Monitor Well Purchase-South Hillsborough Aquifer Recharge Project-Phase II Sun City Well (SMWD-6), Hillsborough County

Staff recommended:

1. Authorize staff to transfer $638,550 from the Zephyr Creek Drainage Improvements: Units 1 & 2 Project (N836) to the Water Quality Monitoring Program for the purchase of the County's SMWD-6 well (C008).
2. Approve entering into an agreement with the County for the purchase of the SMWD-6 well, contingent on FDEP funding, to be executed in accordance with the Signature Authority.

33. Offer for Surplus Lands – Cypress Creek Preserve (CC-1), SWF Parcel No. 13-500-396S

Staff recommended:

- Accept the offer of $2,600,000;
- Approve the Contract for Sale and Purchase and authorize the Executive Director to sign on the behalf of the District;
- Authorize the Chairman and Secretary of the Governing Board to execute the Quit Claim Deed;
- Authorize the conveyance of the District's interest in all phosphate, minerals, metals and petroleum in or on or under the land upon the request of the buyer; and
- Authorize staff to execute any other documents necessary to complete the transaction in accordance with the approved terms.

34. Offer for Surplus Lands – GUM Slough 1 (Gum-1), SWF Parcel No. 19-193-114S

Staff recommended:

- Accept the offer of $676,400;
- Approve the Contract for Sale and Purchase and authorize the Executive Director to sign on the behalf of the District;
- Authorize the Chairman and Secretary of the Governing Board to execute the Quit Claim Deed;
- Authorize the conveyance of the District's interest in all phosphate, minerals, metals and petroleum in or on or under the land upon the request of the buyer; and
- Authorize staff to execute any other documents necessary to complete the transaction in accordance with the approved terms.

Regulation Committee

15.. Individual Water Use Permits Referred to the Governing Board

a. **WUP No. 20001512.014 - CHWA Public Water Supply/Charlotte Harbor Water Association (Charlotte)**
Staff recommended the Board approve the proposed permit attached as an exhibit.

b. **WUP No. 20008836.014 Sarasota County Utilities/Sarasota County BOCC (Sarasota)**
Staff recommended the Board approve the proposed permit attached as an exhibit.

General Counsel's Report

16. Rulemaking

a. **Initiation and Approval of Rulemaking to Amend Rule 40D-8.041, Florida Administrative Code, Minimum Flows, for the Crystal River/Kings Bay, Lower Pithlachascotee River, and Upper Pithlachascotee River Systems**
Staff recommended the Board Initiate and approve rulemaking to amend Rule 40D-8.041, Florida Administrative Code, to modify the minimums flows for the Crystal River/Kings Bay, Lower Pithlachascotee River, and Upper Pithlachascotee River Systems, and authorize staff to make any necessary minor clarifying edits that may result from the rulemaking process.

17. Administrative, Enforcement and Litigation Activities that Require Governing Board Approval

a. **Approval of Consent Order Between SWFWMD and Buckner Land Enterprises, Inc., and GatorWorld Parks of Florida, LLC – CT No. 395018 – Sumter County**
Staff recommended the Board:
1) Approve the Consent Order.
2) Authorize District staff to pursue additional enforcement measures to obtain compliance with the terms and conditions of the Consent Order, including filing any appropriate actions in circuit court, if necessary.

b. **Approval of Consent Order Between SWFWMD and Besim Enterprises, Inc. – CT No. 403162 – Pasco County**
Staff recommended the Board:
1) Approve the Consent Order
2) Authorize District staff to pursue additional enforcement measures to obtain compliance with the terms and conditions of the Consent Order, including filing any appropriate actions in circuit court, if necessary.

~~c. **Authorization to Issue Administrative Complaint and Order – Permit Condition Violations – Walden Pointe Homeowners Association, Inc. – ERP No. 44030339.000 – CT No. 404674 – Hillsborough County**~~
~~Staff recommended the Board:~~
~~1) Authorize District staff to issue an Administrative Complaint and Order to Lawdevco and Walden Pointe and any other necessary parties to obtain compliance with District rules.~~
~~2) Authorize District staff to initiate an action in Circuit Court against Lawdevco and Walden Pointe and any other necessary parties to recover a civil penalty/administrative fine, enforcement costs, litigation costs, and attorney's fees, if appropriate.~~
~~3) Authorize District staff to initiate an action in Circuit Court to enforce the terms of the Administrative Complaint and Order, if necessary.~~

~~d. **Consideration of Final Order – Petition for Declaratory Statement – Shannon R. Turbeville – Hernando County**~~
~~Staff recommended the Board approve the Final Order denying the Petition for Declaratory Statement filed by Shannon R. Turbeville.~~

~~**e. Authorization to Issue Administrative Complaint and Order – Well Construction Violations – Mark James – License Number 11031 – CT Nos. 406326 & 406331 – Hillsborough County**~~
~~Staff recommended the Board:~~
~~1) Authorize District staff to issue an Administrative Complaint and Order to Mark James to obtain compliance, recover an administrative fine/civil penalty, and recover any District costs and fees, if appropriate.~~
~~2) Authorize District staff to obtain compliance with the terms of the Administrative Complaint and Order in Circuit Court, if necessary.~~

Executive Director's Report
18. Approve Governing Board Minutes – February 25, 2020
Staff recommended the Board approve the minutes as presented.

A motion was made and seconded to approve the Consent Agenda. The motion carried unanimously. (00:11:43)

Chair Taylor called the Finance/Outreach & Planning Committee to order. (00:12:58)

Finance/Outreach & Planning Committee
Discussion
19. Consent Item(s) Moved for Discussion - None

~~**20. Fiscal Year 2018-19 Comprehensive Annual Financial Report**~~
~~Staff recommended the Board:~~
~~Accept and place on file the District's Comprehensive Annual Financial Report, including a Single Audit pursuant to Chapter 10.550, Rules of the Auditor General, the Management Letter and the Independent Accountants' Report for fiscal year ended September 30, 2019.~~

21. Legislative Wrap-Up
This item was provided for the Board's information; no action was required.

Submit & File Reports – None

Routine Reports
The following items were provided for the Committee's information, and no action was required.
22. Treasurer's Report and Payment Register
23. Monthly Financial Statement
24. Monthly Cash Balances by Fiscal Year
25. Comprehensive Plan Amendment and Related Reviews Report

Chair Taylor adjourned the Committee and called the Resource Management Committee to order. (00:13:31)

Resource Management Committee
Discussion
26. Consent Item(s) Moved for Discussion

9. Modification of the Repayment of Funds for Lake Jackson Watershed Hydrology Investigation Project (N554)
Secretary Schleicher expressed his disapproval of the modification to the initial funding request with the cooperator.

Staff recommended the Board approve waiving Highlands County's obligation to repay District costs of $28,218.30 for the Lake Jackson Hydrology Investigation Project, Cooperative Funding Initiative project N554.

A motion was made and seconded to approve staff's recommendation. The motion carried unanimously. (00:18:10)

10. **Anna Maria North Island BMPs Phases H and J - Scope Change (W215)**
Secretary Schleicher expressed his disapproval of the requested modifications to the scope of work that was initially agreed upon with the cooperator.

Staff recommended the Board approve the scope revision to decrease the TSS removal from 63,582 lbs./yr. to 15,800 lbs./yr. and reduce the TN removal from 1,468 lbs./yr. to 352 lbs./yr., which are the resource benefits in the cooperative funding agreement.

A motion was made and seconded to approve staff's recommendation. The motion carried with seven in favor and one opposed. Secretary Schleicher stated his opposition was due to the requested modification to the initial scope of work that was agreed upon with the cooperator. (00:19:52)

11. **FARMS – Tippen Bay Properties, LLLP – Doe Hill Citrus Phase 3 (H781), DeSoto County**
Secretary Schleicher asked if the project was meeting its objectives.

Ms. Seachrist responded that phases one and two of the Tippin Bay Properties are meeting their objectives.

Staff recommended:
1) Approve the Tippen Bay Properties, LLLP project for a not-to-exceed reimbursement of $42,000, with $42,000 provided by the Governing Board;
2) Authorize the transfer of $42,000 from fund 010 H017 Governing Board FARMS fund to the H781 Tippen Bay Properties, LLLP project fund; and
3) Authorize the division director to sign the agreement.

A motion was made and seconded to approve staff's recommendation. The motion carried unanimously. (00:20:44)

~~27. **Peace River Manasota Regional Water Supply Authority Update**~~
~~This item was provided for the Board's information; no action was required.~~

Submit & File Reports
28. 2020 Status of the Dover/Plant City Water Use Caution Area Recovery Strategy
29. Proposed Minimum Flows for Lower Peace River and Lower Shell Creek Prior to Independent Scientific Peer Review

Routine Reports
The following items were provided for the Committee's information, and no action was required.
30. Minimum Flows and Levels Status Report
31. Significant Water Resource and Development Projects

Chair Taylor adjourned the Committee and called the Operations, Lands & Resource Monitoring Committee to order. (00:21:58)

Operations, Lands & Resource Monitoring
Discussion

32. **Consent Item(s) Moved for Discussion** - None

33. ~~**Offer for Surplus Lands – Cypress Creek Preserve (CC-1), SWF Parcel No. 13-500-396S**~~
~~Staff Recommended:~~
- ~~Accept the offer of $2,600,000;~~
- ~~Approve the Contract for Sale and Purchase and authorize the Executive Director to sign on the behalf of the District;~~
- ~~Authorize the Chairman and Secretary of the Governing Board to execute the Quit Claim Deed;~~
- ~~Authorize the conveyance of the District's interest in all phosphate, minerals, metals and petroleum in or on or under the land upon the request of the buyer; and~~
- ~~Authorize staff to execute any other documents necessary to complete the transaction in accordance with the approved terms.~~

34. ~~**Offer for Surplus Lands – GUM Slough 1 (Gum-1), SWF Parcel No. 19-193-114S**~~
~~Staff recommended:~~
- ~~Accept the offer of $676,400;~~
- ~~Approve the Contract for Sale and Purchase and authorize the Executive Director to sign on the behalf of the District;~~
- ~~Authorize the Chairman and Secretary of the Governing Board to execute the Quit Claim Deed;~~
- ~~Authorize the conveyance of the District's interest in all phosphate, minerals, metals and petroleum in or on or under the land upon the request of the buyer; and~~
- ~~Authorize staff to execute any other documents necessary to complete the transaction in accordance with the approved terms.~~

35. ~~**Conveyance of Fee Interest for the Ridge Road Right of Way, Pasco County, FL, SWF Parcel Numbers 15-705-107S and 15-705-108P**~~
~~Staff recommended:~~
- ~~Authorize the Chairman and Secretary of the Governing Board to execute the Quit Claim Deed;~~
- ~~Authorize the Executive Director to execute the agreement outlining access and other related responsibilities resulting from the transfer of the right of way;~~
- ~~Authorize the conveyance of the District's interest in all phosphate, minerals, metals and petroleum in or on or under the land; and~~
- ~~Authorize staff to execute any other documents necessary to complete the transaction in accordance with the approved terms.~~

36. **Hydrologic Conditions Report**
This item was provided for the Board's information; no action was required.

Submit & File Reports – None

Routine Reports
The following items were provided for the Committee's information, and no action was required.

37. **Significant Activities**
38. **Structure Operations**
39. **Surplus Lands Update**

Chair Taylor adjourned the Committee and called the Regulation Committee to order. (00:22:30)

Regulation Committee
Discussion
40. Consent Item(s) Moved for Discussion – None

41. Denials Referred to the Governing Board
None was presented.

Routine Reports
The following items were provided for the Committee's information, and no action was required.
42. Dover/Plant City Water Use Caution Area Flow Meter and Automatic Meter Reading (AMR) Equipment Implementation Program Update
43. Overpumpage Report
44. Individual Permits Issued by District Staff

Chair Taylor adjourned the Committee (00:22:49)

General Counsel's Report
Discussion
45. Consent Item(s) Moved for Discussion - None

Submit & File Reports – None

Routine Reports
The following items were provided for the Committee's information, and no action was required.
46. March 2020 Litigation Report
47. March 2020 Rulemaking Update

Committee Liaison Reports
48. Agricultural and Green Industry Advisory Committee
Vice Chair Williamson stated the members of the committee expressed their appreciation for how the District communicates information.

Executive Director's Report
49. Executive Director's Report
Mr. Armstrong provided an update regarding actions taken by the District as a result of COVID-19. He commended staff for their cooperation and patience during this difficult time.

Mr. Armstrong mentioned that Treasurer Rice was unable to attend due to the death of his father, Jerry Rice, who previously served as chair on the Governing Board.

Mr. Armstrong stated a Request to Speak card was received from Mr. Robert Cameron, who was unable to communicate his request due to technical difficulties at the appropriate time in the meeting. Mr. Cameron eventually the joined the meeting and spoke in favor of item 17b and asked for additional information. Staff agreed to communicate with Mr. Cameron following the meeting.

Chair's Report
50. Chair's Report
51. Employee Milestones

The meeting was adjourned at 10:52 a.m.

Attest:

Secretary

Chair

From: Eric DeHaven
To: Gene Heath; Mike Coates
Cc: Yonas Ghile; Doug Leeper; Chris Zajac; Randy Smith
Subject: Lower Peace River/Lower Shell Creek MFL Reevaluation
Date: Wednesday, March 25, 2020 12:13:03 PM

Hi Mike and Gene;

The DRAFT Lower Peace River/ Lower Shell Creek MFL reevaluation report is available as submitted to the Governing Board yesterday and I have a link:

https://www.swfwmd.state.fl.us/sites/default/files/calendar/GB%2003-24-2020%20Item%2029%20LPR%26Shell%20Creek__draft%20MFL%20Document.pdf

We will be providing you a quick overview presentation on this draft report at our meeting on April 8, 2020 – we will be setting this meeting up for remote attendance. The Peer review is scheduled to kick-off on April 3 at 9:00. You will hear additional information on the peer review process and how to attend peer review meetings in an email from Doug Leeper in the next day or so.

Please let me know of questions.

Eric DeHaven, P.G.
Southwest Florida Water Management District
Assistant Director, Resource Management Division
7601 HWY 301N Tampa FL 33637
(813) 985-7481 X2118

From:	Doug Leeper
To:	geneheath@prwcwater.org; MCoates@regionalwater.org
Cc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak; Chris Zajac; Randy Smith; Eric DeHaven; Adrienne E. Vining; Mike R. Bray; Cindy C. Rodriguez; Dennis Ragosta
Subject:	Lower Peace River/Lower Shell Creek Minimum Flows Peer Review
Date:	Wednesday, March 25, 2020 12:38:00 PM
Attachments:	Agenda-Lower Peace_Shell Min Flows Peer Rev Telecon 2020-04-03_V3.pdf

Greetings:

As part of an ongoing reevaluation of the minimum flows established for the Lower Peace River, Southwest Florida Water Management District staff have developed new, proposed minimum flows for the Lower Peace River and proposed minimum flows for Lower Shell Creek. As you know, a minimum flow sets a limit beyond which further water withdrawals would be significantly harmful to the water resources or ecology of the area.

An informational web page for the proposed minimum flows is available on the District web site at https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek.

A draft report on the proposed minimum flows for the Lower Peace River and Lower Shell Creek was presented to the District Governing Board on 3/24/2020. The draft report and associated appendices are available from the Minimum Flows and Levels Documents page of the District web site at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

An independent, scientific peer review of the proposed minimum flows was initiated today (3/25/2020). The panel will conduct its review through use of telephone and web-based teleconferencing, as well as through use of a web board. All peer review panel teleconferences and the web board will be publicly noticed and include opportunities for public comment.

The first peer review panel teleconference will be held on 4/3/2020. An agenda for this teleconference, with call-in and videoconferencing software (Microsoft Teams) log-in information is attached. Additional panel teleconferences are tentatively scheduled for 4/13/2020, 4/20/2020, 4/27/2020, 6/8/2020 and 6/22/2020. Information concerning the teleconferences is available on the District's Boards, Meetings and Events calendar at: https://www.swfwmd.state.fl.us/about/calendar/202004.

Also, beginning on 4/3/2020, a web board established for peer review panel communications and stakeholder comment will be available on the District web site at: https://swfwmd.discussion.community/?forum=765039. The web board is being established for panel communications and file sharing, and to allow the public to view these interactions. The web board will be available for communications between 4/3/2020 and 6/26/2020, when the peer review panel's final report is expected to be delivered to the District. During that period, members of the public that register to use the web board will also be able to post comments regarding the peer review process. The web board will remain open for viewing through at least the end of this year

Following the peer review process, a public workshop will be held to provide information on the proposed minimum flows and solicit additional stakeholder input. Information about the public

workshop will also be available at the District's Boards, Meetings and Events calendar at a later date.

Findings from the independent scientific peer review and all public comments will be summarized and/or made available to the District Governing Board to support their consideration of the proposed minimum flows for the Lower Peace River and Lower Shell Creek later this year.

Let me know if you have any questions or need assistance accessing any of the information identified above.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From:	Yonas Ghile
To:	Steve Adams; Tom Jackson; Sarah Burns; Laura Baumberger
Cc:	Doug Leeper; Eric DeHaven; Randy Smith; Chris Zajac; Xinjian Chen
Subject:	Lower Peace River/Lower Shell Creek Minimum Flows Peer Review
Date:	Thursday, March 26, 2020 9:34:19 AM
Attachments:	Agenda-Lower Peace_Shell Min Flows Peer Rev Telecon 2020-04-03_V3.pdf

Hi All,

An informational web page for the proposed minimum flows for Lower Peace River and Lower Shell Creek is available on the District web site at https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek.

A draft report on the proposed minimum flows for the Lower Peace River and Lower Shell Creek was presented to the District Governing Board on 3/24/2020. The draft report and associated appendices are available from the Minimum Flows and Levels Documents page of the District web site for review at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

An independent, scientific peer review of the proposed minimum flows was initiated today (3/25/2020). The panel will conduct its review through use of telephone and web-based teleconferencing, as well as through use of a web board. All peer review panel teleconferences and the web board will be publicly noticed and include opportunities for public comment.

The first peer review panel teleconference will be held on 4/3/2020. An agenda for this teleconference, with call-in and videoconferencing software (Microsoft Teams) log-in information is attached. Additional panel teleconferences are tentatively scheduled for 4/13/2020, 4/20/2020, 4/27/2020, 6/8/2020 and 6/22/2020. Information concerning the teleconferences is available on the District's Boards, Meetings and Events calendar at: https://www.swfwmd.state.fl.us/about/calendar/202004.

Also, beginning on 4/3/2020, a web board established for peer review panel communications and stakeholder comment will be available on the District web site at: https://swfwmd.discussion.community/?forum=765039. The web board is being established for panel communications and file sharing, and to allow the public to view these interactions. The web board will be available for communications between 4/3/2020 and 6/26/2020, when the peer review panel's final report is expected to be delivered to the District. During that period, members of the public that register to use the web board will also be able to post comments regarding the peer review process. The web board will remain open for viewing through at least the end of this year

Following the peer review process, a public workshop will be held to provide information on the proposed minimum flows and solicit additional stakeholder input. Information about the public workshop will also be available at the District's Boards, Meetings and Events calendar at a later date.

Findings from the independent scientific peer review and all public comments will be summarized and/or made available to the District Governing Board to support their consideration of the proposed minimum flows for the Lower Peace River and Lower Shell Creek later this year.

Let me know if you have any questions or need assistance accessing any of the information identified above.

Best Regards,

Yonas Ghile, Ph.D., P.H
Senior Environmental Scientist
Springs and Environmental Flows Section
Southwest Florida Water Management District
2379 Broad Street
Brooksville, FL 34604
352-796-7211 ext. 4488
yonas.ghile@swfwmd.state.fl.us

From:	Doug Leeper
To:	Pamela.Flores@dep.state.fl.us; Jennifer.G.Adams@dep.state.fl.us; morgan.westberry@dep.state.fl.us; Michelle.Sempsrott@MyFWC.com; eric.nagid@MyFWC.com; Stasey.Whichel@MyFWC.com; Ryan.Hamm@MyFWC.com; Medellin, Donald; Sutherland, Andrew (asutherl@sjrwmd.com); Good, John; Coates, Kathleen (Kathleen.Coates@nwfwmd.state.fl.us); Kathleen.Greenwood@FreshFromFlorida.com; Angela.Chelette@fdacs.gov; Rebecca.Elliott@FDACS.gov; yesenia.escribano@FDACS.gov; jhecker@chnep.org; awebb@chnep.org; enoll@chnep.org; niadevaia@chnep.org; cbojewski@chnep.org
Cc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak; Chris Zajac; Randy Smith; Eric DeHaven; Adrienne E. Vining; Mike R. Bray; Dennis Ragosta; Cindy C. Rodriguez
Subject:	SWFWMD Draft Minimum Flows for Lower Peace River and Lower Shell Creek
Date:	Thursday, March 26, 2020 4:20:00 PM
Attachments:	Agenda-Lower Peace Shell Min Flows Peer Rev Telecon 2020-04-03 V3.pdf

Greetings:

As part of an ongoing reevaluation of minimum flows established for the Lower Peace River, Southwest Florida Water Management District staff have developed new, proposed minimum flows for the Lower Peace River and proposed minimum flows for Lower Shell Creek. As you may know, a minimum flow sets a limit beyond which further water withdrawals would be significantly harmful to the water resources or ecology of the area.

An informational web page for the proposed minimum flows is available on the District web site at https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek.

A draft report on the proposed minimum flows was presented to the District Governing Board on 3/24/2020. The draft report and associated appendices are available from the Minimum Flows and Levels Documents page of the District web site at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

An independent, scientific peer review of the proposed minimum flows was initiated on 3/25/2020. The panel will conduct its review through use of telephone and web-based teleconferencing, and via communication through a web board. All peer review panel teleconferences and the web board will be publicly noticed and include opportunities for public comment.

The first peer review panel teleconference will be held on 4/3/2020. An agenda for this teleconference, with call-in and videoconferencing software (Microsoft Teams) log-in information is attached. Additional panel teleconferences are tentatively scheduled for 4/13/2020, 4/20/2020, 4/27/2020, 6/8/2020 and 6/22/2020. Information concerning the teleconferences is available on the District's Boards, Meetings and Events calendar at: https://www.swfwmd.state.fl.us/about/calendar/202004.

Also, beginning on 4/3/2020, a web board established for peer review panel communications and stakeholder comment will be available on the District web site at: https://swfwmd.discussion.community/?forum=765039. This web board is being established for panel communications and file sharing, and to allow the public to view these interactions. The web board will be available for communications between 4/3/2020 and 6/26/2020, when the peer review panel's final report is expected to be delivered to the District. During that period, member of the public that register to use the web board will also be able to post comments regarding the peer review process. The web board will remain open for viewing through at least the end of this year.

Following the peer review process, a public workshop will be held to provide information on the proposed minimum flows and solicit additional stakeholder input. Information about the public workshop will also be available at the District's Boards, Meetings and Events calendar at a later date.

If you or your agency would like to comment on the proposed minimum flows, you can also send written comments to me. We would appreciate receiving this feedback prior to 5/29/2020 to allow ample time for District staff's review and consideration of any submitted comments.

Findings from the independent scientific peer review and all public comments will be summarized and/or made available to the District Governing Board to support their consideration of the proposed minimum flows for the Lower Peace River and Lower Shell Creek later this year.

Let me know if you have any questions or need assistance accessing any of the information identified above. Also, please feel free to contact me if you would like to schedule a meeting with District staff to discuss the proposed minimum flows.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From:	Dennis Ragosta
To:	Doug Leeper
Cc:	Yonas Ghile; Chris Zajac; Cindy C. Rodriguez
Subject:	RE: SWFWMD Draft Minimum Flows for Lower Peace River and Lower Shell Creek
Date:	Thursday, March 26, 2020 4:59:22 PM

Doug,

Yes, I sent the information to both my Charlotte and Desoto County contacts making them aware of the teleconference and peer review process.

Thanks,
Dennis

From: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Sent: Thursday, March 26, 2020 4:34 PM
To: Dennis Ragosta <Dennis.Ragosta@swfwmd.state.fl.us>
Cc: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>; Chris Zajac <Chris.Zajac@swfwmd.state.fl.us>; Cindy C. Rodriguez <Cindy.Rodriguez@swfwmd.state.fl.us>
Subject: FW: SWFWMD Draft Minimum Flows for Lower Peace River and Lower Shell Creek

Dennis:

- We have sent an informational email like the one below to the City of Punta Gorda, Mike Coates (PRMRWSA) and Gene Heath (PRWC), although it did not have the requested 5/29/2020 "deadline" for comments. We figure we will be working closely with (i.e., meeting and corresponding a lot) with the City, Authority and Cooperative on the minimum flows development process.
- Note that several CHNEP folks were on the distribution list for the email below.
- Was asked today by my bosses to check that as necessary, you have or are planning to let other local governmental groups know about the ongoing peer review and minimum flows development process.

Thanks,

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Doug Leeper
Sent: Thursday, March 26, 2020 4:21 PM
To: Pamela.Flores@dep.state.fl.us; Jennifer.G.Adams@dep.state.fl.us; morgan.westberry@dep.state.fl.us; Michelle.Sempsrott@MyFWC.com; eric.nagid@MyFWC.com; Stasey.Whichel@MyFWC.com; Ryan.Hamm@MyFWC.com; Medellin, Donald <dmedelli@sfwmd.gov>; Sutherland, Andrew (asutherl@sjrwmd.com) <asutherl@sjrwmd.com>; Good, John <John.Good@srwmd.org>; Coates, Kathleen (Kathleen.Coates@nwfwmd.state.fl.us) <Kathleen.Coates@nwfwmd.state.fl.us>; Kathleen.Greenwood@FreshFromFlorida.com; Angela.Chelette@fdacs.gov; Rebecca.Elliott@FDACS.gov; yesenia.escribano@FDACS.gov; jhecker@chnep.org; awebb@chnep.org; enoll@chnep.org; niadevaia@chnep.org; cbojewski@chnep.org
Cc: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>; Xinjian Chen <Xinjian.Chen@swfwmd.state.fl.us>; Chris Anastasiou <Chris.Anastasiou@swfwmd.state.fl.us>; Kristina Deak <Kristina.Deak@swfwmd.state.fl.us>; Chris Zajac <Chris.Zajac@swfwmd.state.fl.us>; Randy Smith <Randy.Smith@swfwmd.state.fl.us>; Eric DeHaven <Eric.Dehaven@swfwmd.state.fl.us>; Adrienne E. Vining <Adrienne.Vining@swfwmd.state.fl.us>; Mike R. Bray <Mike.Bray@swfwmd.state.fl.us>; Dennis Ragosta <Dennis.Ragosta@swfwmd.state.fl.us>; Cindy C. Rodriguez <Cindy.Rodriguez@swfwmd.state.fl.us>
Subject: SWFWMD Draft Minimum Flows for Lower Peace River and Lower Shell Creek

Greetings:

As part of an ongoing reevaluation of minimum flows established for the Lower Peace River, Southwest Florida Water Management District staff have developed new, proposed minimum flows for the Lower Peace River and proposed minimum flows for Lower Shell Creek. As you may know, a minimum flow sets a limit beyond which further water withdrawals would be significantly harmful to the water resources or ecology of the area.

An informational web page for the proposed minimum flows is available on the District web site at https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek.

A draft report on the proposed minimum flows was presented to the District Governing Board on 3/24/2020. The draft report and associated appendices are available from the Minimum Flows and Levels Documents page of the District web site at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

An independent, scientific peer review of the proposed minimum flows was initiated on 3/25/2020. The panel will conduct its review through use of telephone and web-based teleconferencing, and via communication through a web board. All peer review panel teleconferences and the web board will be publicly noticed and include opportunities for public comment.

The first peer review panel teleconference will be held on 4/3/2020. An agenda for this teleconference, with call-in and videoconferencing software (Microsoft Teams) log-in information is attached. Additional panel teleconferences are tentatively scheduled for 4/13/2020, 4/20/2020, 4/27/2020, 6/8/2020 and 6/22/2020. Information concerning the teleconferences is available on the

District’s Boards, Meetings and Events calendar at:
https://www.swfwmd.state.fl.us/about/calendar/202004.

Also, beginning on 4/3/2020, a web board established for peer review panel communications and stakeholder comment will be available on the District web site at: https://swfwmd.discussion.community/?forum=765039. This web board is being established for panel communications and file sharing, and to allow the public to view these interactions. The web board will be available for communications between 4/3/2020 and 6/26/2020, when the peer review panel’s final report is expected to be delivered to the District. During that period, member of the public that register to use the web board will also be able to post comments regarding the peer review process. The web board will remain open for viewing through at least the end of this year.

Following the peer review process, a public workshop will be held to provide information on the proposed minimum flows and solicit additional stakeholder input. Information about the public workshop will also be available at the District’s Boards, Meetings and Events calendar at a later date.

If you or your agency would like to comment on the proposed minimum flows, you can also send written comments to me. We would appreciate receiving this feedback prior to 5/29/2020 to allow ample time for District staff’s review and consideration of any submitted comments.

Findings from the independent scientific peer review and all public comments will be summarized and/or made available to the District Governing Board to support their consideration of the proposed minimum flows for the Lower Peace River and Lower Shell Creek later this year.

Let me know if you have any questions or need assistance accessing any of the information identified above. Also, please feel free to contact me if you would like to schedule a meeting with District staff to discuss the proposed minimum flows.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From:	Doug Leeper
To:	Patrick Lehman; "ryantaylor@polk-county.net"
Cc:	Mike Coates (MCoates@regionalwater.org); Genegeneheath@prwcwater. org Heath (geneheath@prwcwater.org); Cindy C. Rodriguez; Dennis Ragosta; Yonas Ghile; Chris Zajac; Randy Smith; Eric DeHaven; Adrienne E. Vining; Mike R. Bray
Subject:	SWFWMD Draft Minimum Flows for Lower Peace River and Lower Shell Creek
Date:	Friday, March 27, 2020 9:53:00 AM
Attachments:	Agenda-Lower Peace_Shell Min Flows Peer Rev Telecon 2020-04-03_V3.pdf

Good morning Mr. Lehman and Mr. Taylor:

I'm writing today to provide an update on the Southwest Florida Water Management District's ongoing development of proposed minimum flows for the Lower Peace River and Lower Shell Creek. As you may know, a minimum flow sets a limit beyond which further water withdrawals would be significantly harmful to the water resources or ecology of the area.

An informational web page for the proposed minimum flows is available on the District web site at https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek.

A draft report on the proposed minimum flows was presented to the District Governing Board on 3/24/2020. The draft report and associated appendices are available from the Minimum Flows and Levels Documents page of the District web site at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

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Following the peer review process, a public workshop will be held to provide information on the proposed minimum flows and solicit additional stakeholder input. Information about the public

workshop will also be available at the District's Boards, Meetings and Events calendar at a later date.

If you or your agency would like to comment on the proposed minimum flows, you can send written comments to me. We would appreciate receiving this feedback prior to 5/29/2020 to allow ample time for District staff's review and consideration of any submitted comments. Note that District staff have been and will continue to meet with representatives of the Peace River Manasota Regional Water Supply Authority and the Polk Regional Water Cooperative to discuss and solicit feedback on the proposed minimum flows. For example, we recently provided the information contained in this email to Mike Coates and Gene Heath, and will be discussing the proposed minimum flows at the Peace River Coordination meeting scheduled for 4/8/2020.

Findings from the independent scientific peer review and all public comments will be summarized and/or made available to the District Governing Board to support their consideration of the proposed minimum flows for the Lower Peace River and Lower Shell Creek later this year.

Let me know if you have any questions or need assistance accessing any of the information identified above. Also, please feel free to contact me if you would like to schedule a meeting with District staff to discuss the proposed minimum flows.

Doug Leeper
MFLs Program Lead
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Doug.leeper@watermatters.org

From:	Doug Leeper
To:	Phillip Stevens (Philip.Stevens@MyFWC.com); Dave Blewett (dave.blewett@MyFWC.com)
Cc:	Michelle.Sempsrott@MyFWC.com; eric.nagid@MyFWC.com; Stasey.Whichel@MyFWC.com; Yonas Ghile; Ryan.Hamm@MyFWC.com
Subject:	SWFWMD Draft Minimum Flows for Lower Peace River and Lower Shell Creek
Date:	Friday, March 27, 2020 1:04:00 PM
Attachments:	Agenda-Lower Peace_Shell Min Flows Peer Rev Telecon 2020-04-03_V3.pdf

Greetings:

As part of an ongoing reevaluation of minimum flows established for the Lower Peace River, Southwest Florida Water Management District staff have developed new, proposed minimum flows for the Lower Peace River and proposed minimum flows for Lower Shell Creek. As you may know, a minimum flow sets a limit beyond which further water withdrawals would be significantly harmful to the water resources or ecology of the area.

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Findings from the independent scientific peer review and all public comments will be summarized and/or made available to the District Governing Board to support their consideration of the proposed minimum flows for the Lower Peace River and Lower Shell Creek later this year.

Let me know if you have any questions or need assistance accessing any of the information identified above. Also, please feel free to contact me if you would like to schedule a meeting with District staff to discuss the proposed minimum flows.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
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Notice of Meeting/Workshop Hearing

WATER MANAGEMENT DISTRICTS
Southwest Florida Water Management District

RULE NO.: RULE TITLE:
40D-8.041 Minimum Flows

The Southwest Florida Water Management District announces a workshop to which all persons are invited.

DATES AND TIMES: A website (the "WebBoard") will be used to allow public access to and participation in communications among the chairman and members of the independent peer review panel created to conduct a review of the proposed Minimum Flows for the Lower Peace River and Lower Shell Creek in Desoto and Charlotte Counties. The WebBoard will be available for public viewing from 9:00 a.m. April 3, 2020 through December 31, 2020, and will be available for public comment from 9:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020.

PLACE: https://swfwmd.discussion.community/categories

GENERAL SUBJECT MATTER TO BE CONSIDERED: Beginning on April 3, 2020, and continuing through December 31, 2020, interested parties may view communications and documents posted electronically on the WebBoard. The WebBoard will be active and peer review panelists may post information and pose questions, revisions, additions, or deletions to one another, and the public can provide comment directly on any aspect of the proposed Minimum Flows from 9:00 a.m. on April 3, 2020, through 5:00 p.m. on June 26, 2020.

In addition to the WebBoard, the peer reviewers will participate in a series of teleconferences on the proposed Minimum Flows, to be held as follows:

DATE AND TIME: April 3, 2020, 9:00 a.m. – 12:00 Noon

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 131261057#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZTQ4MmFkNGQtNjYwYi00MWE0LTgwNDgtZTFmYzUxYTllNDRh%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: April 13, 2020, 1:00 p.m. – 3:00 p.m.

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 852057527#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_NzI4MzRkNDAtYmFjNy00MGU0LWI5MTQtYWRiNzFjZmIxNWJl%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: April 20, 2020, 1:00 p.m. – 3:00 p.m.

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 69490332#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_ZTJjOTA1NjUtZDhlYS00MjRlLWFjZDItYjBkOTY4NWZmMjU2%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: April 27, 2020, 1:00 p.m. – 3:00 p.m.

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 740405097#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_ODYzNDhjYjAtODU2NC00ZjMwLWI3ZTEtZDFmZTI4YTI1Y2I1%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: June 8, 2020, 1:00 p.m. – 3:00 p.m.

PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 619330915#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_NzU1YWI1ZGItNWRhZC00MTEyLTg2NDEtMGYyNzllZTdiNzll%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.

DATE AND TIME: June 22, 2020, 1:00 p.m. – 3:00 p.m.
PLACE: Teleconference. Call-in number: (786)749-6127; Participant passcode: 551367222#. Microsoft Teams link: https://teams.microsoft.com/l/meetup-join/19%3ameeting_OGQxMmE1MTYtYzAwNy00OWVjLTkyMDItYzc4NmM0ODk1MGEy%40thread.v2/0?context=%7b%22Tid%22%3a%227d508ec0-09f9-4402-8304-3a93bd40a972%22%2c%22Oid%22%3a%224df5e295-84da-43eb-a6f9-f053183d9029%22%7d.
NOTE: One or more members of the District's Governing Board may attend these meetings.
A copy of the agenda may be obtained by contacting: A copy of the agenda for the teleconferences may be obtained by contacting: Doug Leeper, MFLs Program Lead, at (352)796-7211, ext. 4272, or Doug.Leeper@swfwmd.state.fl.us. Agendas will also be accessible at https://swfwmd.discussion.community/categories.
Pursuant to the provisions of the Americans with Disabilities Act, any person requiring special accommodations to participate in this workshop/meeting is asked to advise the agency at least 5 days before the workshop/meeting by contacting: SWFWMD Human Resources Office, (352)796-7211, ext. 4706; 1(800)423-1476 (FL only), ext. 4706 or email to ADACoordinator@swfwmd.state.fl.us. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1(800)955-8771 (TDD) or 1(800)955-8770 (Voice).
For more information, you may contact: For more information, you may contact: Doug Leeper at (352)796-7211, ext. 4272, or by email at Doug.Leeper@swfwmd.state.fl.us.

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Proposed Minimum Flows for the Lower Peace River

Southwest Florida Water Management District

Tampa, Florida
April 08, 2020

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Draft Schedule

Major Activities	Schedule
PRWC/PRMRWSA outreach	April 08, 2020
Stakeholders and Peer review of MFLs report	Mar 25 - Jun 26, 2020
Public workshop	July 15 - 30, 2020
Presentation to Governing Board (MFLs report and rules)	October 2020

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Lower Peace River Minimum Flows

- Adopted in 2010, with reevaluation within 5 years
- Initial reevaluation completed in 2015
- Comprehensive reevaluation scheduled for 2020
- The draft report and associated appendices are available: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

LPR Minimum Flows & Permit Conditions

Combined Flows from gages @ Arcadia, Horse and Joshua	Lower Peace MFL		
	Block 1 (Apr 20 - Jun 25)	Block 2 (Oct 27 – Apr 19)	Block 3 (Jun 26 - Oct 26)
<130 cfs	0% (0%)		
130 - 625 cfs	16% (16%)		
≥ 625 cfs	16% *(16%*)	29%* (28%*)	38%* (28%*)
* Maximum daily withdrawal also limited to 400 cfs			

- PRMRWSA permit condition in yellow
- Although permitted to withdraw up to 400 cfs (258 mgd), in the settlement agreement PRMRWSA agreed to a 325 cfs (210 mgd) maximum to offset impacts from potential PRWC withdrawals

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

2010 vs. 2020 Ecological Criteria

2010 Ecological Criteria	2020 Ecological Criteria
1. Salinity-based habitats* (<2, <5, <10, <15, <20 psu)	1. Salinity-based habitats* (<2, <5, <10, <15, <20 psu) 2. Floodplain inundation 3. Habitats for 7 fish species and Blue Crab 4. Water quality (dissolved oxygen, nutrients, chlorophyll, color)

- < 2 psu salinity volume was the most sensitive metric to flow reduction scenarios
- Minimum flows developed based on preserving 85% of < 2 psu salinity volume

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

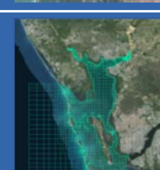
2010 vs. 2020 Hydrodynamic Model

Hydrodynamic model (Chen 2010)

- Structured 3D hydrodynamic model
- Limited to Upper Charlotte Harbor
- 13-month calibration/validation period
- 3-year simulation period (2000 - 2002)

Hydrodynamic model (Chen 2020)

- Unstructured 3D hydrodynamic model
- Extended to the entire Charlotte Harbor
- New LiDAR and bathymetry data
- 21-month calibration/validation period
- 8-year simulation period (2007 - 2014)



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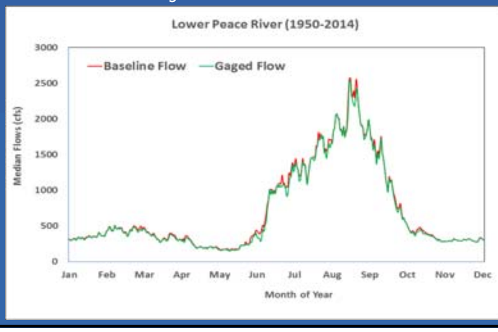
6

Baseline flows

- Developed baseline flows (flows with no withdrawals) for the period from 1950 through 2014



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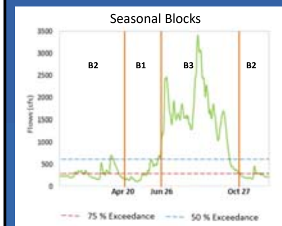
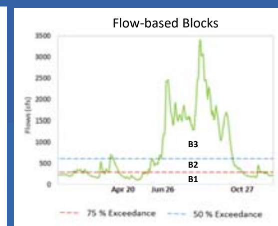
2010 vs. 2020: Change from Seasonal to Flow-Based Blocks





- Flow-based blocks are more representative of low, medium and high flows conditions.

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Proposed Minimum Flows for the Lower Peace River

Block	If Combined Flow at Peace River @ Arcadia, Horse and Joshua Gages on Previous Day is	Allowable Flow Reduction
All	Less than130 cfs	0%
Block 1	Between 130 cfs and 149 cfs	Flow in excess of 130 cfs
	Between 149 cfs and 297 cfs	13% of flow
Block 2	Between 297 cfs and 386 cfs	Flow in excess of 297 cfs plus 39 cfs*
	Between 386 cfs and 622 cfs	23% of flow
Block 3	Between 622 cfs and 1,037 cfs	Flow in excess of 622 cfs plus 143 cfs**
	Greater than 1,037 cfs	40% of flow

* 39 cfs is 13% of 297 cfs
** 143 cfs is 23% of 622 cfs
The total permitted maximum withdrawals on any day shall not exceed 400 cfs

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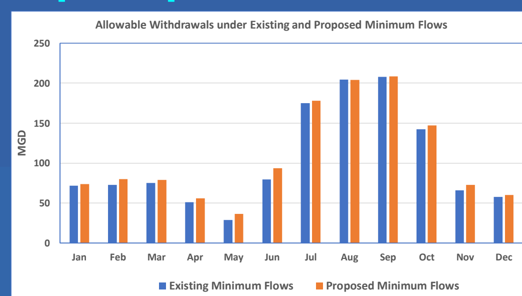
Impacts of Proposed Minimum Flows to PRMRWSA



- The proposed minimum flows will allow slightly more withdrawals and PRMRWSA will not be negatively impacted.

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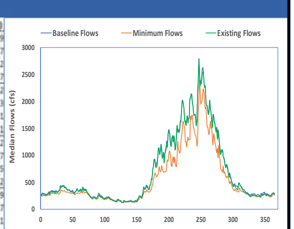
Minimum flow Status - Lower Peace River

Period	Statistics	Baseline Flows (cfs)	Minimum Flows (cfs)	Existing Flows (cfs)
Annual	5-Yr Mean	1180.4	1014.9	1163.9
	10-Yr Mean	1182.3	1017.5	1166.7
	5-Yr Median	522.9	403	506.2
	10-Yr Median	523.5	403.4	507.7
Block 1	5-Yr Mean	294.8	270.4	287.2
	10-Yr Mean	302.8	278.3	295.3
	5-Yr Median	248.1	226.6	241
	10-Yr Median	256.1	234.6	249.1
Block 2	5-Yr Mean	491.2	398.6	471.2
	10-Yr Mean	495.9	401.9	476.7
	5-Yr Median	449.3	359.1	428.5
	10-Yr Median	452.1	361.9	432.2
Block 3	5-Yr Mean	2140.9	1817.9	2115.9
	10-Yr Mean	2134.2	1813.7	2110.7
	5-Yr Median	1531.9	1368.3	1507.1
	10-Yr Median	1518.5	1158.2	1494.9



- Proposed Lower Peace River minimum flows are currently met, and are projected to be met during the next 20-year planning period

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Summary of the Proposed Minimum Flows

- Proposed Lower Peace Rive minimum flows are based on maintaining 85% of the 2 psu salinity habitat
- Protect the Lower Peace River, Lower Shell Creek and Charlotte Harbor
- Proposed Lower Peace River minimum flow is currently met, and projected to be met during the next 20-year planning period
- PRMRWSA will not be negatively impacted by the proposed Lower Peace River minimum flows

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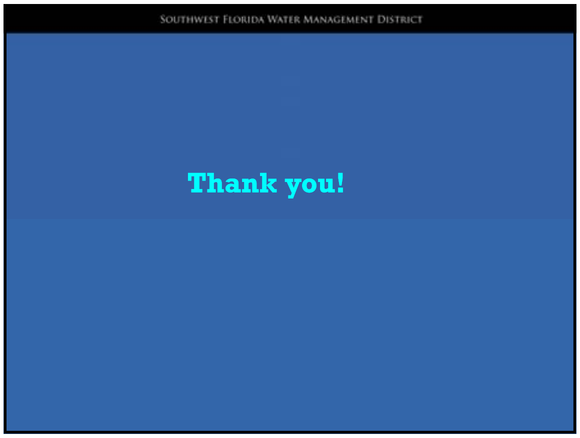

13

From:	Dale Helms
To:	Eric DeHaven; Yonas Ghile; Doug Leeper; Chris Zajac; Randy Smith
Cc:	Gene Heath; Edward de la Parte Jr.; Elizabeth Perez; Mary Thomas
Subject:	RE: Lower Peace River/Lower Shell Creek MFL Reevaluation
Date:	Wednesday, April 1, 2020 9:08:29 AM
Attachments:	Page from GB 03-24-2020 Item 29 LPR&Shell Creek _ draft MFL Document.pdf

Hi Eric,

Thanks for sharing the draft re-evaluation report with PRWC and PRMRWSA. Upon an initial review of the proposed Lower Peace River minimum flows table, something didn't quite make sense to me. The way the District has proposed it, shouldn't the values for flow Block 2 and Block 3 be modified per the attached? Otherwise, you would exceed 23% in Block 2 (for river flows of 336-386 cfs) and exceed 40% in Block 3 (from 798-1037 cfs). Maybe I'm missing something—please let me know what you think.

Best,
Dale

A. Dale Helms, PE
Senior Client Services Manager | Vice President
200 East Robinson Street, Suite 1400 | Orlando, FL 32801
P 407.377.2656 | M 407.247.2455
carollo.com

From: Gene Heath <geneheath@prwcwater.org>
Sent: Wednesday, March 25, 2020 4:01 PM
To: Edward de la Parte Jr. <EDelaparte@dgfirm.com>; Elizabeth Perez <lperez@collectivewater.com>; Dale Helms <dhelms@carollo.com>; Mary Thomas <mthomas@carollo.com>
Subject: Fw: Lower Peace River/Lower Shell Creek MFL Reevaluation

FYI

From: Eric DeHaven <Eric.Dehaven@swfwmd.state.fl.us>
Sent: Wednesday, March 25, 2020 12:13 PM
To: Gene Heath <geneheath@prwcwater.org>; Mike Coates <MCoates@regionalwater.org>
Cc: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>; Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>; Chris Zajac <Chris.Zajac@swfwmd.state.fl.us>; Randy Smith <Randy.Smith@swfwmd.state.fl.us>
Subject: Lower Peace River/Lower Shell Creek MFL Reevaluation

Hi Mike and Gene;

The DRAFT Lower Peace River/ Lower Shell Creek MFL reevaluation report is available as submitted to the Governing Board yesterday and I have a link:

https://www.swfwmd.state.fl.us/sites/default/files/calendar/GB%2003-24-2020%20Item%2029%20LPR%26Shell%20Creek__draft%20MFL%20Document.pdf

We will be providing you a quick overview presentation on this draft report at our meeting on April 8, 2020 – we will be setting this meeting up for remote attendance. The Peer review is scheduled to kick-off on April 3 at 9:00. You will hear additional information on the peer review process and how to attend peer review meetings in an email from Doug Leeper in the next day or so.

Please let me know of questions.

Eric DeHaven, P.G.
Southwest Florida Water Management District
Assistant Director, Resource Management Division
7601 HWY 301N Tampa FL 33637
(813) 985-7481 X2118

(PRMRWSA). This low flow threshold of 130 cfs has been included in currently established minimum flows for the Lower Peace River and successfully implemented for permitted withdrawals by the PRMRWSA since 2010. Allowable percent of flow reductions associated with the proposed minimum flows for the Lower Peace River are summarized in the following table.

336

Block	If Combined Flow on Previous Day is	Allowable Flow Reduction
All	Less than130 cfs	0%
Block 1	Between 130 cfs and 149 cfs Between 149 cfs and 297 cfs	Flow in excess of 130 cfs 13% of flow
Block 2	Between 297 cfs and ~~386~~ cfs Between ~~386~~ cfs and 622 cfs	Flow in excess of 297 cfs plus 39 cfs* 23% of flow
Block 3	Between 622 cfs and ~~1,037~~ cfs Greater than ~~1,037~~ cfs	Flow in excess of 622 cfs plus 143 cfs** 40% of flow

* 39 cfs is 13% of 297 cfs
** 143 cfs is 23% of 622 cfs
The total permitted maximum withdrawals on any day shall not exceed 400 cfs

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Minimum flows status assessments for the Lower Peace River were conducted based on the best available information, using block-specific and five-year and ten-year moving mean and median flow statistics. The assessment results indicated that the proposed minimum flows for the Lower Peace River are being met and are also expected to be met over the next 20 years. Development of a recovery strategy or specific prevention strategy associated with adoption of the proposed minimum flows for the Lower Peace River is, therefore, not necessary. If approved by the District Governing Board, the proposed minimum flows identified in this report for the Lower Peace River will replace the currently adopted minimum flows for the river included in District rules.

Similar to the minimum flows proposed for the Lower Peace River, proposed minimum flows for Lower Shell Creek are block-based minimum flows that specify allowable reductions in baseline flows into Shell Creek Reservoir. Required releases associated with the proposed minimum flows for Lower Shell Creek, expressed as percentage of inflow to Shell Creek Reservoir are summarized in the following table.

Block	If Inflow to Reservoir on Previous Day is	Required Flow Release
Block 1	Between 0 cfs and 56 cfs	87% of inflow
Block 2	Between 56 cfs and 137 cfs	77% of inflow
Block 3	Greater than 137 cfs	60% of inflow

Southwest Florida
Water Management District

2379 Broad Street, Brooksville, Florida 34604-6899
(352) 796-7211 or 1-800-423-1476 (FL only)
WaterMatters.org

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170 Century Boulevard
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(863) 534-1448 or
1-800-492-7862 (FL only)

Sarasota Office
6750 Fruitville Road
Sarasota, Florida 34240-9711
(941) 377-3722 or
1-800-320-3503 (FL only)

Tampa Office
7601 U.S. 301 North (Fort King Highway)
Tampa, Florida 33637-6759
(813) 985-7481 or
1-800-836-0797 (FL only)

March 6, 2020

Pat Lehman, P.E.
Executive Director
Peace River/Manasota Regional
Water Supply Authority

Ryan Taylor
Executive Director
Polk Regional Water Cooperative

Subject: Request to Consider Change to MFL Maximum Day Withdrawal in Rule 40D-8.041(8)(c), F.A.C. – Letter Dated June 25, 2019

Dear Mr. Lehman and Mr. Taylor:

Thank you for your letter regarding the Lower Peace River Minimum Flows and the established 400 cfs maximum day withdrawal quantity. As you mentioned, District staff are in the process of re-evaluating the Lower Peace River Minimum Flows. The re-evaluation process has included review of the 400 cfs maximum day withdrawal quantity. We would like to discuss the full minimum flows re-revaluation with you this month as we begin stakeholder outreach and peer review for the new, proposed Minimum Flows.

Regarding the maximum day quantity, the District intends to continue using 400 cfs as a maximum day limit for withdrawals from the Lower Peace River (that portion of the river below the USGS Peace River at Arcadia gage #02296750). The current PRMRWSA permit also includes a maximum day withdrawal limit of 400 cfs. It is important to note that withdrawals from portions of the Peace River upstream of the Lower Peace River do not impact the maximum day quantity associated with the PRMRWSA permit. The District has not established a maximum day withdrawal limit for the upstream portions of the Peace River. We anticipate that a maximum day withdrawal limit may be defined when we complete a re-evaluation of the Upper Peace River Minimum Flows in 2025 (as currently scheduled in the District's Minimum Flows and Levels Priority List and Schedule). If such a limit is defined, we anticipate that it would be set for a specific segment of the Peace River. In addition, if a permit application is received for withdrawals on the Upper Peace River the District will review that application pursuant to the requirements in Chapter 40D-2, F.A.C., including the need for a maximum day quantity.

Should you have any questions, please contact me at (813) 985-7481 extension 2118 or by email at Eric.DeHaven@swfwmd.state.fl.us.

Sincerely,

Eric C. DeHaven, P.G.
Assistant Director, Resource Management Division
Southwest Florida Water Management District

Cc: Michael Coates, PRMRWSA
Gene Heath, PRWC
Douglas Manson, Esq.
Edward de la Parte, Esq.

Southwest Florida Water Management District

Proposed Minimum Flows for the Lower Peace River

Southwest Florida Water Management District

Tampa, Florida
April 08, 2020

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Southwest Florida Water Management District

Planned Schedule

Major Activities	Schedule
Stakeholders and Peer review of MFLs report	Mar 25 - Jun 26, 2020
PRWC/PRMRWSA outreach	Ongoing
Public workshop	July 15 - 30, 2020
Presentation to Governing Board (MFLs report and rules)	October 2020

2

2

Southwest Florida Water Management District

Lower Peace River

- River segment downstream of Aradia
- Based on combined flows:
  - Peace River at Arcadia
  - Joshua Creek at Nocatee
  - Horse Creek near Arcadia
- Minimum flows
  - Adopted in 2010
  - Initial reevaluation in 2015
  - Comprehensive reevaluation and adoption scheduled for 2020

3

Southwest Florida Water Management District

LPR Minimum Flows & Permit Conditions

Combined Flows from gages @ Arcadia, Horse and Joshua	Lower Peace MFL		
	Block 1 (Apr 20 - Jun 25)	Block 2 (Oct 27 – Apr 19)	Block 3 (Jun 26 - Oct 26)
<130 cfs	0% (0%)		
130 - 625 cfs	16% (16%)		
≥ 625 cfs	16% *(16%*)	29%* (28%*)	38%* (28%*)
* Maximum daily withdrawal also limited to 400 cfs			

- PRMRWSA permit condition in yellow

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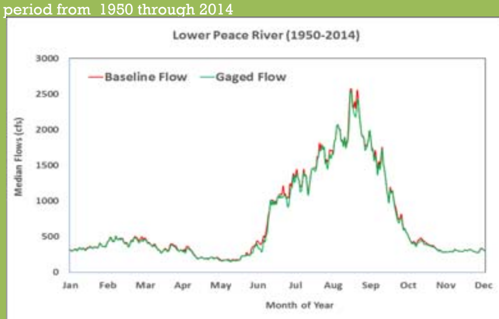
Southwest Florida Water Management District

Developed Baseline flows

- Developed baseline flows (flows with no withdrawals effect) for the period from 1950 through 2014



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Southwest Florida Water Management District

Developed Flow-Based Blocks

Currently Used
Flow-Based Blocks

Previously Used
Calendar-Based Blocks

- Flow-based blocks better represent low, medium and high flow conditions for minimum flows development and implementation

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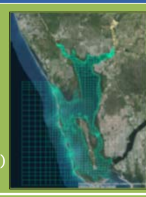
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Enhanced Hydrodynamic Modeling

Current model (Chen 2020)

- Unstructured 3D hydrodynamic model
- Includes entire Charlotte Harbor
- New LiDAR and bathymetry data
- 21-month calibration/validation period
- 7.7-year simulation period (Jan 2007 – Aug 2014)



Previously used model (Chen 2010)

- Structured 3D hydrodynamic model
- Limited to Upper Charlotte Harbor
- 13-month calibration/validation period
- 3-year simulation period (2000 - 2002)

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Enhanced Ecological Criteria and Considerations

Current Ecological Criteria and Considerations	Previous (2010 Evaluation) Ecological Criteria and Considerations
▪ Salinity-based habitats (<2, <5, <10, <15, <20 psu) ▪ Floodplain inundation ▪ Habitats for 7 fish species and Blue Crab ▪ Water quality (dissolved oxygen, nutrients, chlorophyll, color)	▪ Salinity-based habitats (<2, <5, <10, <15, <20 psu)

- < 2 psu salinity volume was the metric most sensitive to modeled flow reductions
- Minimum flows developed based on preserving 85% of < 2 psu salinity volume

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Proposed Minimum Flows for the Lower Peace River

	Extreme Low Flow	Low Flow (B1)	Medium Flow (B2)	High Flow (B3)
Flow (cfs)	<=130	>130 - 297	> 297 - 622	>622
Allowable withdrawals (%)	0%	13%	23%	40%*
* 400 cfs Maximum daily withdrawal Limit				

Block	If Combined Flow at on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs	flow - 130 cfs
	>149 cfs - 297 cfs	13% of flow
Block 2	>297 cfs - 386 cfs	23% of (flow - 297 cfs) plus 13% of the remaining flow
	> 386 cfs - 622 cfs	23% of flow
Block 3	> 622 cfs - 1,037 cfs	40% of (flow - 622 cfs) plus 23% of the remaining flow
	>1,037 cfs	40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

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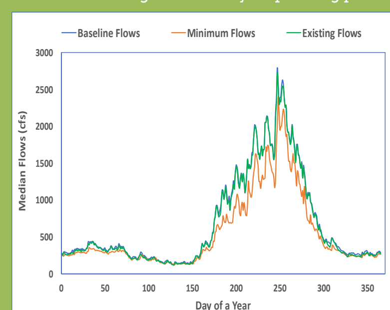
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Minimum flow Status - Lower Peace River

- Proposed Lower Peace River minimum flows are currently met, and are projected to be met during the next 20-year planning period



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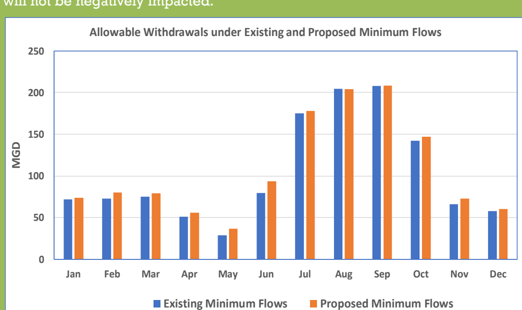
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Impacts of Proposed Minimum Flows to PRMRWSA

- The proposed minimum flows will allow slightly more withdrawals and PRMRWSA will not be negatively impacted.



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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Proposed Minimum Flows Summary

- Proposed minimum flows for the Lower Peace River and Lower Shell Creek are based on maintaining 85% of the 2 psu salinity volume.
- Proposed minimum flows are protective of all environmental values identified for consideration when establishing minimum flows
- Proposed Lower Peace River minimum flow is currently met, and projected to be met during the next 20-year planning period

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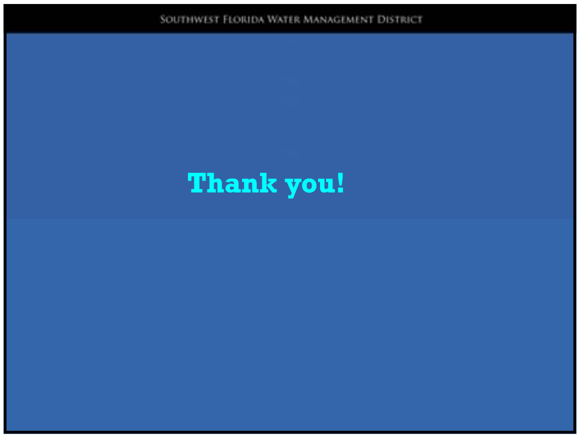

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From:	Doug Leeper
To:	"Hans Zarbock"
Cc:	Yonas Ghile; Chris Zajac; Cindy C. Rodriguez
Subject:	Info on SWFWMD Lower Peace River and Lower Shell Creek minimum flows
Date:	Tuesday, April 7, 2020 9:07:00 AM

Hans:

I assume you've been made aware or the District's ongoing minimum flows work on the Lower Peace River and Lower Shell Creek, but figure it wouldn't hurt to send you some summary information regarding current activities associated with the project.

As part of an ongoing reevaluation of minimum flows established for the Lower Peace River, Southwest Florida Water Management District staff have developed new, proposed minimum flows for the Lower Peace River and proposed minimum flows for Lower Shell Creek. As you know, a minimum flow sets a limit beyond which further water withdrawals would be significantly harmful to the water resources or ecology of the area.

An informational web page for the proposed minimum flows is available on the District web site at https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek.

A draft report on the proposed minimum flows was presented to the District Governing Board on 3/24/2020. The draft report and associated appendices are available from the Minimum Flows and Levels Documents page of the District web site at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

An independent, scientific peer review of the proposed minimum flows was initiated on 3/25/2020. The panel will conduct its review through use of telephone and web-based teleconferencing, and via communication through a web board. All peer review panel teleconferences and the web board will be publicly noticed and include opportunities for public comment.

The first peer review panel teleconference was held on 4/3/2020. Information pertaining to the meeting, including the agenda, a meeting summary, and meeting presentation materials are posted on a web board that has been established for the review process.

The web board is available on the District web site at: https://swfwmd.discussion.community/?forum=765039. This web board was established for panel communications and file sharing, and to allow the public to view these interactions. The web board will be available for communications between 4/3/2020 and 6/26/2020, when the peer review panel's final report is expected to be delivered to the District. During that period, member of the public that register to use the web board will also be able to post comments regarding the peer review process. The web board will remain open for viewing through at least the end of this year.

Additional panel teleconferences are currently scheduled for 4/13/2020, 4/20/2020, 4/27/2020, 6/8/2020 and 6/22/2020. Information concerning the teleconferences is available on the District's Boards, Meetings and Events calendar at: https://www.swfwmd.state.fl.us/about/calendar/202004.

Following the peer review process, a public workshop will be held to provide information on the proposed minimum flows and solicit additional stakeholder input. Information about the public workshop will also be available at the District's Boards, Meetings and Events calendar at a later date.

If you or your agency would like to comment on the proposed minimum flows, you can also send written comments to me. We would appreciate receiving this feedback prior to 5/29/2020 to allow ample time for District staff's review and consideration of any submitted comments.

Findings from the independent scientific peer review and all public comments will be summarized and/or made available to the District Governing Board to support their consideration of the proposed minimum flows for the Lower Peace River and Lower Shell Creek later this year.

Let me know if you have any questions or need assistance accessing any of the information identified above. Also, please feel free to contact me if you would like to schedule a meeting with District staff to discuss the proposed minimum flows.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Proposed Minimum Flows for the Lower Peace River and Lower Shell Creek

Yonas Ghile, XinJian Chen, Douglas Leeper, Chris Anastasiou and Kristina Deak

Technical Advisory Committee Meeting
Charlotte Harbor Estuary Program
April 17, 2020

1

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Planned Schedule

Major Activities	Schedule
Stakeholders and peer review of minimum flows report	Mar 25 - Jun 26, 2020
Stakeholders outreach	Ongoing
Public workshop	July 15 - 30, 2020
Presentation to Governing Board (minimum flows report and rules)	October 2020

- The draft report and associated appendices are available from the Minimum Flows and Levels Documents page of the District web site at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports

2

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Minimum Flows Development and Implementation

- The minimum flow for a given watercourse is the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area. – *Section 373.042, Florida Statutes*
- The District uses a 15% change in habitat or resource to identify significant harm; approach is supported by peer review panels and scientific literature
- Use the best information available for consideration of ten environmental values identified in the State Water Resource Implementation Rule

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Minimum Flows Development and Implementation....

- Use data and tools for predicting withdrawal-related impacts
- Select most sensitive criterion or criteria to identify recommended minimum flows
- Consider stakeholder input and independent, scientific peer review findings
- Develop necessary recovery and prevention strategies
- Initiate and complete rulemaking
- Continue monitoring and conduct status assessments
- Reevaluation as needed

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Lower Peace River

- River segment downstream of Arcadia
- Based on combined flows:
  - Peace River at Arcadia
  - Joshua Creek at Nocatee
  - Horse Creek near Arcadia
- Minimum flows
  - Adopted in 2010
  - Initial reevaluation in 2015
  - Comprehensive reevaluation and adoption scheduled for 2020
- PRMRWSA withdraws water from the Peace River

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Lower Peace Minimum Flows

Combined Flows from gages @ Arcadia, Horse and Joshua	Lower Peace MFL		
	Block 1 (Apr 20 - Jun 25)	Block 2 (Oct 27 – Apr 19)	Block 3 (Jun 26 - Oct 26)
<130 cfs	0%		
130 - 625 cfs	16%		
≥ 625 cfs	16%	29%	38%
Maximum daily withdrawal also limited to 400 cfs			

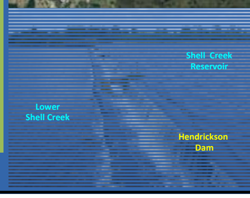
6

6

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Lower Shell Creek

- Creek segment from Hendrickson Dam to confluence with the Peace River
- No adopted minimum flows
  - Adoption scheduled for 2020
- Will be based on flows:
  - Shell Creek near Punta Gorda
- City of Punta Gorda withdraws water from Shell Creek Reservoir, which was constructed in 1965



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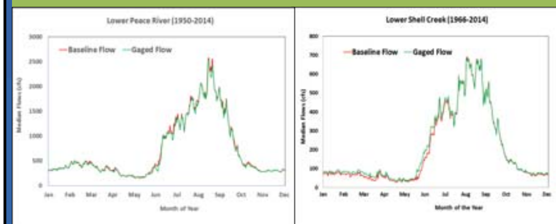
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Updated Baseline Flows

- Baseline flows (flows with no withdrawal impacts) developed for the Lower Peace River (1950 – 2014) and Shell Creek (1966 – 2014)



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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Developed Flow-Based Blocks

Currently Used Flow-Based Blocks

Previously Used Calendar-Based Blocks

- Flow-based blocks better represent low, medium and high flow conditions for minimum flows development and implementation

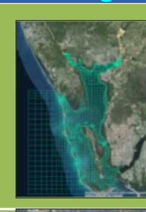
9

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Enhanced Hydrodynamic Modeling

Current model (Chen 2020)

- Unstructured 3D hydrodynamic model
- Includes entire Charlotte Harbor
- New LiDAR and bathymetry data
- 21-month calibration/validation period
- 7.7-year simulation period (Jan 2007 – Aug 2014)



Previously used model (Chen 2010)

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- 13-month calibration/validation period
- 3-year simulation period (2000 - 2002)

10

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Enhanced Ecological Criteria and Considerations

Current Ecological Criteria and Considerations	Previous (2010 Evaluation) Ecological Criteria and Considerations
• Salinity-based habitats (<2, <5, <10, <15, <20 psu) • Floodplain inundation • Habitats for 7 fish species and Blue Crab • Water quality (dissolved oxygen, nutrients, chlorophyll, color)	• Salinity-based habitats (<2, <5, <10, <15, <20 psu)

- **< 2 psu salinity volume** was the metric most sensitive to modeled flow reductions
- Minimum flows developed based on preserving 85% of **< 2 psu salinity volume**

11

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Proposed Minimum Flows for the Lower Peace River

	Extreme Low Flow	Low Flow (B1)	Medium Flow (B2)	High Flow (B3)
Flow (cfs)	<=130	>130 - 297	> 297 - 622	>622
Allowable withdrawals (%)	0%	13%	23%	40%*
* 400 cfs Maximum daily withdrawal Limit				

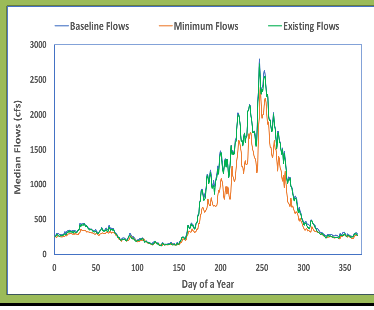
Block	If Combined Flow at on Previous Day is	Allowable Flow Reduction
All	<130 cfs	0%
Block 1	>130 cfs - 149 cfs	flow - 130 cfs
	>149 cfs - 297 cfs	13% of flow
Block 2	>297 cfs - 386 cfs	23% of (flow - 297 cfs) plus 13% of the remaining flow
	> 386 cfs - 622 cfs	23% of flow
Block 3	> 622 cfs - 1,037 cfs	40% of (flow - 622 cfs) plus 23% of the remaining flow
	>1,037 cfs	40% of flow
The total permitted maximum withdrawals on any day shall not exceed 400 cfs		

12

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Minimum Flow Status - Lower Peace River

- Proposed Lower Peace River minimum flows are currently met, and are projected to be met during the next 20-year planning period



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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Proposed Minimum Flows for the Lower Shell Creek

Block	If Inflow to Reservoir on Previous Day is:	Required Flow at Hendrickson Dam is:
Block 1	0 cfs - 56 cfs	87% of inflow
Block 2	>56 cfs - 137 cfs	77% of inflow
Block 3	>137 cfs	60% of inflow

- No Low Flow or maximum daily withdrawal thresholds are required, as the City of Punta Gorda withdrawals are from Shell Creek Reservoir, not directly from the Creek

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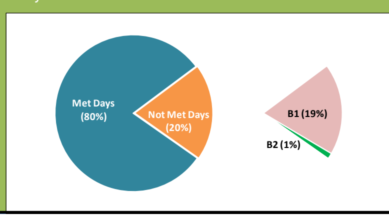
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Minimum Flows Status for Lower Shell Creek

- Proposed Lower Shell Creek minimum flows for low (B1) and medium flow (B2) blocks are not met. A recovery strategy would need to be adopted along with adoption of the minimum flows
- Proposed recovery strategy include:
  - Use of Reverse Osmosis and Peace Pipeline for water supply in dry season
  - Dam bypass facility
  - Regulatory actions



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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Proposed Minimum Flows Summary

- Proposed minimum flows for the Lower Peace River and Lower Shell Creek are based on maintaining 85% of the 2 psu salinity habitat
- Proposed minimum flows are protective of all environmental values identified for consideration when establishing minimum flows
- Proposed Lower Peace River minimum flow is currently met, and projected to be met during the next 20-year planning period
- Proposed minimum flows for Lower Shell Creek are currently not met, and a recovery strategy is required

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Information on the District Web Site

- Minimum flows and level documents and reports: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports
- Minimum flows page for the Lower Peace River and Lower Shell Creek: https://www.swfwmd.state.fl.us/projects/mfls/lower-peace-river/lower-shell-creek
- Meeting/teleconference announcements posted on the Boards, Meetings & Events calendar: https://www.swfwmd.state.fl.us/about/calendar/month
- SWFWMD WebForum: https://swfwmd.discussion.community

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Thank you!

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

EXTRAS

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Salinity Habitat Modeling Results

Table 6-4. Summary less than 2 psu, 5 psu, 10psu, 15 psu and 20 psu salinity habitats by block under the proposed minimum flow relative to baseline scenario.

Block 1									
	Water Volume (Million m^3)			Bottom Area (Million m^2)			Shoreline Length (km)		
Salinity (<psu)	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change
2	10.8	9.1	15.0%	7.3	6.4	12.4%	44.1	38.2	13.3%
5	18.2	16.8	7.5%	11.2	10.3	7.3%	69.0	64.7	6.2%
10	25.8	24.7	4.0%	15.0	14.5	3.5%	88.9	86.8	2.4%
15	31.4	30.6	2.4%	18.1	17.7	2.3%	96.4	95.9	0.5%
20	43.5	42.2	3.2%	24.0	23.4	2.5%	99.9	99.9	0.1%
Block 2									
	Water Volume (Million m^3)			Bottom Area (Million m^2)			Shoreline Length (km)		
Salinity (<psu)	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change
2	21.5	18.3	15.0%	13.2	11.5	12.8%	78.5	69.3	11.8%
5	26.4	24.2	8.2%	15.7	14.5	7.2%	89.3	85.0	4.8%
10	31.4	29.8	5.2%	18.4	17.5	4.9%	95.7	94.2	1.6%
15	40.1	37.5	6.7%	22.5	21.3	5.2%	99.5	98.9	0.7%
20	60.7	56.0	7.8%	31.2	29.3	5.9%	101.8	101.5	0.3%
Block 3									
	Water Volume (Million m^3)			Bottom Area (Million m^2)			Shoreline Length (km)		
Salinity (<psu)	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change	Baseline Flow	Min. Flow	% Change
2	32.9	28.0	15.0%	19.6	16.9	13.9%	94.1	88.0	6.5%
5	38.4	32.7	14.8%	21.8	19.1	12.5%	97.8	94.1	3.8%
10	49.2	41.9	14.8%	26.2	23.0	12.0%	100.5	98.8	1.8%
15	65.0	55.2	15.0%	32.6	28.6	12.0%	102.4	101.3	1.1%
20	85.1	76.9	9.7%	41.8	37.9	9.4%	103.4	103.1	0.3%

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Floodplain Inundation Modeling Results

Flow Reduction Scenarios	Average Stage (ft, NAVD 88)	Inundation Floodplain Wetland Area (acre)	Change in Inundation area Relative to Baseline (%)
Baseline	0.30	189.4	-
5%	0.29	186.7	1.40%
10%	0.29	183.9	2.90%
15%	0.28	181.7	4.00%
20%	0.28	179.8	5.10%
25%	0.27	177.0	6.50%
30%	0.26	174.0	8.10%
35%	0.25	171.8	9.30%
40%	0.25	169.7	10.40%

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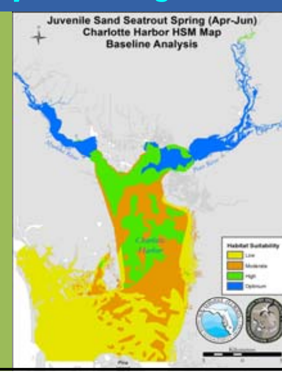
SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Habitat Suitability Modeling

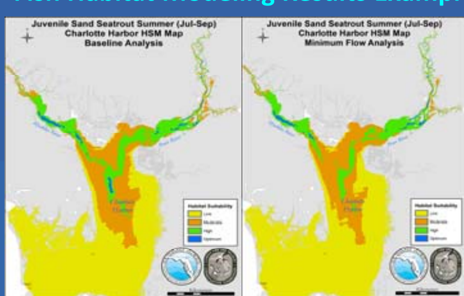
- Habitat Suitability Modeling
  - Salinity
  - Temperature
  - Dissolved oxygen
  - Water depth
  - Bottom type
- Modeled low, moderate, high and optimum habitat suitability for:
  - J-Bay Anchovy
  - A-Bay Anchovy
  - EJ-Southern Kingfish
  - EJ-Red
  - EJ-Spot
  - J-Sand Seatrout
  - JA-Hogchoker



22

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Fish Habitat Modeling Results Example



Habitat Zones	Low	Moderate	High	Optimum
Habitat Gained/Lost	+ 7.0%	- 2.4%	- 4.3%	- 0.3%

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SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Water Quality Modeling Results

- The proposed minimum flows for the Lower Peace River and Lower Shell Creek would have no significant effect on:
  - Dissolved Oxygen
  - Chlorophyll
  - Color, and
  - Nitrogen and Phosphorus

24

From:	Angel Martin
To:	Doug Leeper
Subject:	Minimum Flows--Lower Peace River and Lower Shell Creek
Date:	Monday, April 13, 2020 5:01:07 PM

As per the discussion concerning the subject peer review panel teleconference for the Lower Peace River and Lower Shell Creek, the following are my comments/suggestions for consideration that I briefly discussed.

1. Concerning the stratification of freshwater/saltwater in the open waters of Charlotte Bay, Mr. Tomasko clearly answered my questions and described the processes involved when a large volume of freshwater is discharged to the bay. I suggest that the two reports that Mr. Tomasko referred to be included in the final report.
2. Suggest further discussion of the base flow component determined with the modeling and how reasonable is this component when compared to other available information.
3. Suggest adding some discussion in the final report (a paragraph or two) on model limitation and uncertainty (as discussed by Mr. Sheng) and which parameters may be more uncertain for developing minimum flows and levels.
4. Suggest adding a section on possible future data collection and updating the analysis and models. For example, perhaps additional vegetation data are needed. Also, there are locations where tributaries may require gaging for better model simulation and analysis. Additional data may be required to reduce model uncertainty as discussed in item 3 above. As mentioned during the teleconference by others, the analysis should be reviewed on a regular and systematic basis. As additional data are collected and analyzed, the models should be updated and revised and the minimum flows and levels adjusted, if warranted.

I appreciate being able to comment on this important work. Please contact me if you need any additional information or clarification.

____

Angel Martin
813-767-6944

From:	Doug Leeper
To:	Angel Martin
Cc:	Yonas Ghile; Xinjian Chen; Kristina Deak; Chris Anastasiou; Chris Zajac; Randy Smith; Eric DeHaven; Adrienne E. Vining; Mike R. Bray
Subject:	RE: Minimum Flows--Lower Peace River and Lower Shell Creek
Date:	Tuesday, April 14, 2020 7:52:00 AM

Angel:

- Thanks for contributing to the Lower Peace River/Lower Shell Creek minimum flows peer review teleconference yesterday and submitting your comments in writing.
- Your comments will be shared with staff for consideration and noted in the meeting summary that will be prepared for yesterday's teleconference.
- With your permission, I will also post your email to the peer review webforum. Let me know if this is OK or you would prefer that I not do so.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Angel Martin <amartin217@tampabay.rr.com>
Sent: Monday, April 13, 2020 5:01 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: Minimum Flows--Lower Peace River and Lower Shell Creek

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____

Angel Martin
813-767-6944

From:	Angel Martin
To:	Doug Leeper
Subject:	RE: Minimum Flows--Lower Peace River and Lower Shell Creek--Reply
Date:	Tuesday, April 14, 2020 9:01:56 AM

OK to post. Thanks for the opportunity to comment.

____

Angel Martin

From: Doug Leeper [mailto:Doug.Leeper@swfwmd.state.fl.us]
Sent: Tuesday, April 14, 2020 7:52 AM
To: Angel Martin <amartin217@tampabay.rr.com>
Cc: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>; Xinjian Chen <Xinjian.Chen@swfwmd.state.fl.us>; Kristina Deak <Kristina.Deak@swfwmd.state.fl.us>; Chris Anastasiou <Chris.Anastasiou@swfwmd.state.fl.us>; Chris Zajac <Chris.Zajac@swfwmd.state.fl.us>; Randy Smith <Randy.Smith@swfwmd.state.fl.us>; Eric DeHaven <Eric.Dehaven@swfwmd.state.fl.us>; Adrienne E. Vining <Adrienne.Vining@swfwmd.state.fl.us>; Mike R. Bray <Mike.Bray@swfwmd.state.fl.us>
Subject: RE: Minimum Flows--Lower Peace River and Lower Shell Creek

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Doug Leeper
MFLs Program Lead
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Southwest Florida Water Management District
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Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

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I appreciate being able to comment on this important work. Please contact me if you need any additional information or clarification.

____

Angel Martin
813-767-6944

DL

Moderator

95 posts

Doug Leeper

13 days ago

Written comments e-mailed to Doug Leeper by Angel Martin on April 13, 2020, based on his oral comments provided during the April 13, 2020 peer review panel teleconference.

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As per the discussion concerning the subject peer review panel teleconference for the Lower Peace River and Lower Shell Creek, the following are my comments/suggestions for consideration that I briefly discussed.

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I appreciate being able to comment on this important work. Please contact me if you need any additional information or clarification.

Angel Martin

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Chat (0)

From: Stempien, Jessica Lea
To: Doug Leeper
Subject: MFL Question
Date: Tuesday, April 14, 2020 10:25:28 AM

Hey Doug,

Where can I find the shapefile for the watershed for Lower Peace River and Shell Creek that was used for the MFL? Any help is appreciated.

Regards,

Jessica Stempien
Water Policy and Planning Coordinator, SW FL District
Office of Agricultural Water Policy
Florida Department of Agriculture and Consumer Services

(850) 510-5555 Cell
Jessicalea.stempien@FreshFromFlorida.com

Field Office, Lutz
www.FreshFromFlorida.com

From: Doug Leeper
To: "Stempien, Jessica Lea"
Cc: Yonas Ghile; Kristina Deak; Chris Zajac; Jessica Hendrix
Subject: RE: MFL boundary
Date: Wednesday, April 15, 2020 8:32:00 AM

Thanks for letting me know, Jessica.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Stempien, Jessica Lea <JessicaLea.Stempien@fdacs.gov>
Sent: Wednesday, April 15, 2020 8:30 AM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: MFL boundary

Hi Doug,

Jessica Hendrix sent me the boundary layer. I am good to go. She is awesome.

Regards,

Jessica Stempien
Water Policy and Planning Coordinator, SW FL District
Office of Agricultural Water Policy
Florida Department of Agriculture and Consumer Services

(850) 510-5555 Cell
Jessicalea.stempien@FreshFromFlorida.com

Field Office, Lutz
www.FreshFromFlorida.com

CHNEP Technical Advisory Committee Meeting
Friday April 17th, 2020
9:30 am – 2:00 pm
WebEx Virtual Meeting Room

AGENDA

Connect Remotely via WebEx
https://puntagorda.webex.com/puntagorda/j.php?MTID=mb42d74811adc07cd7af5252f028e4f2e
Join by phone
1-650-479-3208 Call-in toll number (US/Canada)
Access code: 628 717 099

1. Call to Order and Introductions — Justin Saarinen, Co-Chair
2. Agenda Additions or Deletions — Justin Saarinen, Co-Chair
3. Public Comment on Agenda Items — Justin Saarinen, Co-Chair
4. Technical Advisory Committee (TAC) December 4, 2019 Meeting Minutes — Justin Saarinen, Co-Chair
5. TAC Co-Chair Election — Justin Saarinen, Co-Chair
6. CHNEP Update— Jennifer Hecker, CHNEP
7. Charlotte Harbor SWIM Plan Presentation — Lizanne Garcia, ~~SWFWMD~~
8. Proposed Minimum Flows for Lower Peace River and Lower Shell Creek — Dr. Yonas Ghile, SWFWMD
9. Harmful Algae Bloom Presentation — Dr. Robert Weisberg, College of Marine Science, University of South Florida
10. Lower Charlotte Harbor Flatwoods Hydrological Restoration Project Update — Roger Copp, Water Science Associates
11. Economic Valuation Study Presentation— Nicole Iadevaia, CHNEP
12. CHNEP Projects Updates— Nicole Iadevaia, CHNEP
13. TAC Membership Project Updates — Justin Saarinen, Co-Chair
14. Public Comment — Justin Saarinen, Co-Chair
15. Future Meeting's Topics, Location and Date — Justin Saarinen, Co-Chair

    Date: August 13th, 2020; Location: Charlotte Community Foundation, Punta Gorda.
16. Adjourn — Justin Saarinen, Co-Chair

1. **CALL TO ORDER AND INTRODUCTIONS**

After TAC Co-Chair calls meeting to order, members will introduce themselves.

2. **AGENDA ADDITIONS OR DELETIONS**

3. **PUBLIC COMMENT ON AGENDA ITEMS**

Each participating member of the public is afforded up to 3 minutes total to speak on agenda topics only at this point in the meeting.

4. **TECHNICAL ADVISORY COMMITTEE (TAC) DECEMBER 4, 2019 MEETING MINUTES**

Recommendation: Approval of the minutes from December 4, 2019 TAC meeting.
Attachment: Draft December 4, 2019 TAC Meeting Minutes

5. **TAC CO-CHAIR ELECTION FOR CALENDAR YEAR 2020**

TAC bylaws stipulate that Co-Chairs are elected on an alternating basis annually at each spring meeting for 2 year terms ,the staggered two-year terms ensures that a new Co-Chair will be paired with an experienced Co-Chair. Nominations are being sought for one of the Co-Chair positions in advance of the next meeting for staff to compile into a nominations list. TAC members can nominate themselves or another TAC member whom they have previously conferred with to confirm are willing to serve.

- *Nominations are requested to be submitted by COB Wednesday, April 15th, 2020 using the link provided:* http://survey.constantcontact.com/survey/a07eh0cvjz9k8iwskjv/start

The list of nominees will be brought forward for consideration and voting upon at the meeting.

TAC Co-Chair duties include alternating chairing of TAC meetings as well as alternating attendance of Management Committee meetings to brief them on TAC comments on items before them for discussion. The TAC Co-Chair briefing the Management Committee meeting has voting privileges at that meeting as well. CHNEP staff provides email meeting notices of future Management meetings to the Co-Chairs, as well as personal pre-meeting TAC meeting briefings to assist the TAC Co-Chairs in their role. TAC Co-Chair Justin Saarinen will be facilitating this discussion.

6. **CHNEP UPDATE**

The following represents program activity highlights since the beginning of the last Management Conference cycle to the beginning of this one.

Partner contributions received:
CHNEP staff prepared customized 2020 Invoice letters to all 10 counties and 25 cities in the CHNEP area. These packets included the FY20 invoice, CHNEP 2019 CCMP, 2020 Nature Calendar and Project Fact Sheets. Since last cycle, FY20 annual contributions received from:

- Sarasota County
- Charlotte County
- Lee County
- Polk County
- Manatee County
- Hardee County
- DeSoto County

- City of Cape Coral
- City of Fort Myers
- City of Punta Gorda
- City of Sanibel
- City of Bonita Springs
- Town of Fort Myers Beach
- City of Venice
- City of North Port
- City of Winter Haven
- Village of Estero
- City of Arcadia
- City of Bartow

Charlotte County has indicated that this year, they intend to increase their annual contribution to $25,000 per year. DeSoto County resumed contributions as well.

<u>Donations received</u>:
- CHNEP has received $2,481.91 in private donations since last cycle

<u>Grants submitted and/or awarded</u>:
- Fish Florida for kids' fishing poles for our kids' Sustainable Fishing Clinic Events – CHNEP also submitted a grant for supplies to fund future Sustainable Fishing Clinic Events
- SWFWMD FY20 Agreement executed
- CHNEP awarded 5 recipients Conservation Grants for a total amount of $8,710.00
- CHNEP has received 8 applications for Conservation Grants to be reviewed by CHNEP staff
- Awarded a Grant Donation from The Ocean Foundation in the amount of $2,200.00 for an event that the CHNEP Executive Director attended.
- Working on establishing a multi-year funding agreement with Charlotte County ($25,000 each year)

<u>Grant progress reports submitted</u>:
- Q1 Report submitted to Charlotte County WCIND grant for Sustainable Fishing Clinics January 2020
- Q1 Progress Report submitted to FDEP for salary agreement with CHNEP. The report discusses tasks done for outreach & restoration, the report was submitted January 2020.
- Q1 Progress Report submitted to FDEP for NRDA grant for the LCHFI project January 2020.
- The final report to Fish Florida for the fishing pole grant was submitted January 2020.
- EPA end of year report for FY19 was submitted December 2019.
- EPA MBEWBE for FY19 was submitted December 2019.
- SWFWMD report for FY19 agreement staff time and Upper CCHMN was completed and invoiced February 2020.
- SWFWMD report for FY20 Q1 was submitted February 2020.
- The US EPA End of Year summary report for FY2019 was submitted December 2019.
- Completed and submitted CHNEP FY15-FY19 Program Evaluation Report March 2020.
- FY21 budget input to City of Punta Gorda's financial system and finalizing draft FY21 work plan & budget March 2020.

<u>Letters of support for partner grant applications</u>:
- Support for the Charlotte Harbor Flatwoods Florida Forever Project
- Support for Alligator Creek Restoration Project

- Support for Orange Hammock Ranch Florida Forever Acquisition
- Support for Orange Pallardy State Conservation Easement Florida Forever Acquisition
- Support for Reduce Nutrient Loadings for Harmful Algal Blooms Management Research
- Support for Conservation Foundation of the Gulf Coast's proposal to the Natural Resources Conservation Service's Regional Conservation Partnership Program (RCPP)

Regional and multi-jurisdictional organizational meetings CHNEP staff participated in:
- SWFWMD EAC Meeting, Tampa
- One Water – One Charlotte water working group
- CHNEP Management and Policy Committee Meetings
- Estero Bay Agency on Bay Management- Cela Tega Estero Bay Conference
- Everglades Coalition Conference
- American Water Resources Association Conference
- Chambers of Commerce Southwest Florida Legislative Delegation
- Management Conference Field Trip to Blackbeard Ranch
- Charlotte Harbor Flatwoods Meeting , SFWMD's Fort Myers Service Center
- Monthly ANEP Board of Directors Meetings (3)
- SWERT (Southwest Florida Estuarine Restoration Team) Englewood
- SWERT Steering Committee Meeting
- South Florida Ecosystem Restoration Task Force-Science Coordination Group Meeting
- NOAA training on "Planning and Facilitating Collaborative Meetings" Training
- C-43 Reservoir Water Quality Feasibility Study meeting in Hendry County
- M-Cores LaBelle Meeting
- Charlotte Harbor Flatwoods Initiative Meeting
- Habitat Restoration Needs Sub-Committee Meeting in LaBelle
- Science Coordination Group of South Florida Meeting, West Palm Beach
- Deepwater Horizon Restoration Summit
- SFWMD Governing Board Mtg., Ft. Myers
- SFWMD Caloosahatchee BMAP Update Meeting
- Regional Ambient Monitoring Program (RAMP) Meeting, Sarasota
- Warm Mineral Springs site visit
- FDEP South District Strategic Monitoring Meeting
- Southwest Florida Climate Compact Meeting with FL Chief Resiliency Officer

CHNEP Staff Presentations:
- December 2019 Charlotte County Water Quality Task Force
- December 2019 Deepwater Horizon Restoration Summit
- January 2020 Cela Tega-Estero Bay Conference - Harmful Algae Blooms
- January 2020 Cela Tega-Estero Bay Conference - Habitat Restoration Needs
- January 2020 Everglades Coalition Conference – Seagrass Restoration
- January 2020 Boca Grande - Red Tide Forum
- January 2020 Audubon of Southwest Florida – CHNEP uniting Partners & Resources
- February 2020 Ancient Islands Sierra Club (in Winter Haven) – CHNEP Overview
- February 2020 Pelican Sound Annual Meeting in Estero - Harmful Algae Blooms
- February 2020 Polk County Board of County Commission Meeting – CHNEP Overview
- March 2020 Presentation at Everglades Wonder Gardens in Bonita Springs – Water Quality

CHNEP Publications and Outreach Events:
- CHNEP Winter 2020 Harbor Happenings was designed, printed and mailed out.
- CHNEP worked with EPA staff and contractor to have CHNEP Brochure doc translated to

Spanish for Spring printing (printing and delivery postponed due to Coronavirus). This is part of fulfilling the Public Outreach Strategy to reach underserved communities, including using translated materials.

- CHNEP held kick-off meeting on a new Public Outreach project to create short CHNEP videos highlighting overall org and CCMP Actions and then four more detailed focusing on each of the four CCMP actions. This is part of fulfilling the Public Outreach Strategy on employing multi-media approaches.
- Reviewed applications for 2nd cycle of CHNEP Conservation grants
- CHNEP worked on creating an interactive GIS story map of Adventures in the Watershed which is available at www.chnep.org/online-learning-portal.
- CHNEP did external events including at 2020 Water, Wings and Wild Things Kids Festival in Polk County in January, booth at the SW FL American Water Resource Association Conference in January, the Swamp Cabbage festival in LaBelle in February, and the Chalo Nitka (meaning Big Bass in Seminole native language) Festival in Moore Haven in March.
- CHNEP went with Chambers of Commerce from Southwest Florida to FL State Capitol to meet with numerous legislators/legislative staff on water and environmental land protection funding needs.
- CHNEP organized and hosted a special field trip for CHNEP Management Committee members to Blackbeard's Ranch in Myakka City, where members heard presentation from a rancher who has won awards for sustainable agricultural practices and The Florida Conservation Group president as to how to support sustainable agricultural practices.
- CHNEP participated in the social media national campaign #iheartestuaries in February to raise awareness about the nation's estuaries and the many economic and environmental benefits they provide.

CHNEP Monthly Volunteer Events:

- January Horseshoe Crab Training & Monitoring Workshop: CHNEP organized and hosted volunteer event with presentation from the Florida Fish and Wildlife Commission – Fish and Wildlife Research Institute giving a presentation on horseshoe crabs and how to monitoring and report information about them in the citizen science monitoring effort.
- February Trash Tackle Coastal Cleanup Event: CHNEP organized a community waterway cleanup as part of a year-long awareness campaign facilitated by the Gulf of Mexico Alliance and the #embracethegulf2020 campaign.
- March Water Quality Monitoring- this event was planned and promoted, but had to be postponed due to Coronavirus.

Community Events CHNEP participated in:

- CHNEP educated 2nd grade students from Polk County about Harmful Algal Blooms (HABs) at the 2020 Water, Wings, and Wild Things Kids Festival
- Pelican Landing Eco Fair
- Swamp Cabbage Festival (Hendry County)
- Chalo Nitka Festival (Glades County)
- Multiple Upcoming Outreach Events- ON HOLD or CANCELLED

Outreach Analytics:

- 579 new subscribers for CHNEP educational mailings (6221 total individual subscribers)
- 1,802 unique visitors and 2,563 page visits to CHNEP website
- 54 new volunteers have joined (434 total active volunteers now), contributing 310 volunteer hours last cycle
- 80 new Facebook followers (1,379 followers)

- 76 new Facebook Likes (1235 total likes)

Media / Press:
11/2019 Pond Restoration Cape Coral - Fox 4 Now
11/2019 Cape Coral High Sustainability - WINK News
01/2020 Cela Tega Event Highlights - NewsPress
01/2020 Estero Bay Cela Tega Event - WGCU Radio
01/2020 Boca Grande Red Tide Forum - Boca Beacon
02/2020 Orange Hammock Ranch Florida Forever – WINK News

CHNEP Executive Director Jennifer Hecker will be presenting the CHNEP Update.

Recommendation: For discussion only.

Attachments: None

7. **SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT'S (SWFWMD) CHARLOTTE HARBOR SWIM PLAN PRESENTATION**

This presentation on progress of the updated Charlotte Harbor SWIM Plan will be given by SWFWMD representative, Lizanne Garcia. A final draft of the updated Charlotte Harbor SWIM Plan is expected to be presented to the Governing Board in May 2020. District staff will request the Governing Board authorize staff to submit the final draft plan to the FDEP, FFWCC, FDACS and appropriate local governments for their review and comments. At the end of the review period, District staff will consider the comments, incorporate them as appropriate, and bring the final plan before the Governing Board for approval.

The following text provides background on the origin of the SWIM Plan and update: In recognition of the need to place additional emphasis on restoration, protection, and management of the surface water resources of the State, the Florida Legislature, through the Surface Water Improvement and Management (SWIM) Act of 1987, directed the State's water management districts to "design and implement plans and programs for the improvement and management of surface water" (Section 373.451 F.S.). Charlotte Harbor was included in the first Southwest Florida Water Management District's (SWFWMD) SWIM Priority List adopted in 1988.
The original Charlotte Harbor SWIM Plan was approved in 1993 and updated in 2000. The District began this most recent update in late 2017 with assistance from ESA-Scheda. The focus areas for the plan are 1) Water Quality; 2) Hydrologic Restoration; and 3) Natural Systems. Water quality analysis and issues and drivers were presented to the CHNEP TAC in April 2018. A second presentation was provided to the CHNEP TAC in December 2018 and included summaries of:

- findings related to impairment determinations and status and trends in water quality;
- findings related to the updated pollutant loading model; and
- findings related to the updated status and trends of uplands and wetlands in the watershed.

The presentation also provided an overview of quantifiable objectives for the CH SWIM watershed for the areas of Water Quality, Hydrologic Restoration and Natural Systems and some of the proposed management actions.

Between 2018 and 2019, the region experienced a severe Red Tide event. Concurrent with this event, District staff and partners noticed a loss of seagrass habitat, and an increase in macroalgal accumulation in certain areas of Charlotte Harbor and Lemon Bay. The updated Charlotte Harbor SWIM Plan was originally expected to be approved by January 2019, but completion of a final draft of the plan was delayed to allow the District and our partners to better assess seagrass conditions and determine research needs and/or projects that could be included in the updated SWIM plan.

Recommendation: For discussion only.

Attachments: None.

8. PROPOSED MINIMUM FLOWS FOR LOWER PEACE RIVER AND LOWER SHELL CREEK

SWFWMD representative Dr. Yonas Ghile will be sharing updates on the ongoing re-evaluation of minimum flows established for the Lower Peace River. The Southwest Florida Water Management District has been directed by the State Legislature to establish minimum flows for flowing watercourses within its boundary. As currently defined by statute, "the minimum flow for a given watercourse shall be the limit at which further withdrawals would be significantly harmful to the water resources or ecology of the area." Once adopted into the District's Water Levels and Rates of Flow Rules within the Florida Administrative Code, minimum flows can be used for water supply planning, water use permitting and environmental resource regulation.

Southwest Florida Water Management District staff have developed new, proposed minimum flows for the Lower Peace River and proposed minimum flows for Lower Shell Creek. The draft report and associated appendices are available from the Minimum Flows and Levels Documents page of the District web site at: https://www.swfwmd.state.fl.us/projects/mfl/documents-and-reports.

Recommendation: For discussion only.

Attachments: Proposed Minimum Flows and Levels for the Lower Peace River and Shell Creek Draft Report

9. HARMFUL ALGAE BLOOM RESEARCH

Given the various ongoing algae blooms throughout Southwest Florida, CHNEP would like to continue the discussion regarding these events and bring the most up to date research and findings to member of the Committee for discussion. Dr. Robert Weisberg will be sharing some of his research on the 2018 red tide event.

A summary of the recent research featured in the presentation follows. The intensity and location of the 2018 *Karenia brevis* red tide outbreak on the west Florida continental shelf is attributed to a combination of water property observations and numerical circulation model simulations. These confirm the initiation region being offshore, the manifestation region being along the shoreline and the delivery mechanism (from initiation to manifestation) being an upwelling favorable coastal ocean circulation. The intensity is attributed to the cells remaining in the manifestation region from the prior 2017 bloom being reinforced by cells newly formed offshore in 2018.

Recommendation: For discussion only.

Attachments: Weisberg et al. (2019) The Coastal Ocean Circulation Influence on the 2018 West Florida Shelf *K. brevis* Red Tide Bloom

10. LOWER CHARLOTTE HARBOR FLATWOODS HYDROLOGICAL RESTORATION PROJECT UPDATE

CHNEP is a member of the Charlotte Harbor Flatwoods Initiative (CHFI), comprised of multiple local, state and federal agencies, this group is focused on efforts to restore natural drainage across the Gator Slough Watershed with water that has been unnaturally impounded on the Babcock-Webb WMA and diverted from the Yucca Pens WMA, Caloosahatchee, and tidal creeks to Charlotte Harbor. Working with members of the CHFI, CHNEP was awarded

Deepwater Horizon Oil Spill NRDA (Natural Resource Damage Assessment) funding to conduct a project that would monitor current conditions in the impacted area and produce an integrated surface-groundwater hydrological model and the Lower Charlotte Harbor Flatwoods 'Strategic Restoration Planning Tool' Report. Modeling work will include hydropattern mapping of natural, current, and potential future conditions scenarios in the Lower Charlotte Harbor Flatwoods area. The Report will provide guidance to local governments and agencies for how best to restore connections and manage surface waters flowing from the Babcock-Webb WMA and Yucca Pens Unit through tidal creeks discharging into eastern Charlotte Harbor and the Caloosahatchee River.

The objectives of the CHFI are sheet flow enhancement, natural flow enhancement to Charlotte Harbor and the Caloosahatchee River, water quality improvement, groundwater recharge, high water levels and flooding reduction, and fish and wildlife habitat enhancement. Recently, the contracted work was awarded to Water Science Associates who will work with multiple qualified sub-contractors familiar with the area to conduct the monitoring as well as produce the hydrological modeling 'tool' and report. Roger Copp, from Water Science Associates, will be presenting and overview of the project as well as the draft groundwater and flow monitoring plans.

Recommendation: For discussion only.

Attachments: Contractor Agreement for Lower Charlotte Harbor Flatwoods Project
Draft Groundwater Monitoring Plan
Draft Flow Monitoring Plan
Lower Charlotte Harbor Flatwoods Project Fact Sheet

11. **ECONOMIC VALUATION STUDY UPDATE**

The CHNEP identified the need for an updated Economic Valuation Study for the CHNEP program area (including the expansion area).The focus of the economic valuation analysis is to quantify the economic activity tied to natural resources (water primarily, as well as wildlife and habitat protection). This would be in terms of tax revenues, jobs, tourism, real estate revenues, and other income generating activity. The natural resources within the CHNEP program area play a key role in the popularity and growth of the region. As population pressure grows, it is important to improve understanding of the connection of these resources to the economy in order to better meet the needs of the public. This project will provide information that allows policymakers to evaluate the existing natural capital and its associated services.

The first phase of the project included a 'Community Input' portion. The Contractor gave presentations to all four CHNEP Management Conference Committees (Technical and Citizens Advisory Committees, Management Committee and Policy Committee) during the winter cycle and followed up with emails and phone interviews with willing stakeholders who provided additional input on areas and projects that should be emphasized during the course of the study.

The contractor has begun the process of gathering the appropriate data and worked with CHNEP staff to create the first draft technical memos summarizing data available as well as the approach for the data input and modeling. Modeling will commence over the summer and the Contracted Economic Valuation team will be presenting the draft and final reports for comment at the Fall and Winter 2020 cycle meetings. CHNEP Research & Outreach Manager, Nicole Iadevaia will be presenting the initial findings from the project with the Committee.

Recommendation: For discussion only.

Attachments: Draft Data Input Technical Memo 1
Draft Technical Memo: Economic Impact Approach 2a
Draft Technical Memo: Fiscal Impact Approach 2b
Economic Valuation Study Project Fact Sheet

12. **CHNEP PROJECTS UPDATES**

In addition to the projects featured earlier on the agenda, several research and/or restoration projects (or phases of projects) in the program area are currently underway with CHNEP FY19 and FY20 funds. A number were kicked-off at the end of FY19 or are launching at the beginning of FY20 and will all be completed by September 2021. CHNEP is working in partnership with multiple entities to fund and projects manage these efforts in part or in whole. Nicole Iadevaia, CHNEP Research & Outreach Manager will be giving the committee updates on the progress of select research and restoration projects.

2019 Projects:

- Quantifying the WQ Benefits of SAV
- Gateway to Myakka River State Park – Marsh Restoration
- Warm Mineral Springs Creek Restoration

2020 Projects:

- Habitat Restoration Needs Phase II

Recommendation: For discussion only.

Attachments: Updated Project Fact Sheets.

13. **TAC MEMBERSHIP UPDATES**

Each member will have up to 5 minutes to update the Committee on their respective research, restoration, public education and engagement projects currently being completed to protect and restore the CHNEP program area. This time also serves as an opportunity for member to discuss topics of interest to the Committee members; TAC Co-Chair Justin Saarinen will be leading and facilitating this discussion.

14. **PUBLIC COMMENT**

Each participating member of the public is afforded up to 3 minutes total to speak at this point in the meeting.

15. **FUTURE MEETING'S TOPICS, LOCATION AND DATE**

The first TAC meeting for 2020 will be: **August 13, 2020** at the Charlotte Community Foundation in Punta Gorda. Please mark your calendars. Additionally, if you have ideas of prominent scientists (including those outside the CHNEP area) that you would like to invite for a future presentations please email Nicole at niadevaia@chnep.org.

16. **ADJOURN**

April 22, 2020 Polk Regional Water Cooperative Regular Meeting
Agenda Item #7

SUBJECT

Combined Projects Technical Team Update

DESCRIPTION

The technical consulting team (Team One) was selected in October 2017 to complete feasibility studies of 3 projects. The consulting contract was later amended to include a fourth project in 2019.

Katie Gierok (Team One / Wright-Pierce) will provide a presentation to update the Board on the progress of the Phase 1 Combined Projects.

- Southeast Wellfield and Water Production Facility
  - The Conceptual Design Report (CDR) was completed in October 2019 and the Preliminary Design Report (PDR) is underway. It is anticipated to be delivered in June or July 2020.
- West Polk Wellfield and Water Production Facility
  - The Aquifer Performance Test (APT) was completed in November 2019 with positive results. The CDR is underway with expected delivery to the TAC in March 2020.
- Peace Creek Integrated Resources Plan
  - A water supply availability process is underway and must be finalized with Southwest Florida Water Management (SWFWMD). A project recommendation has been developed and presented to the TAC and includes wetland treatment and aquifer recharge.
- Peace River and Land Use Transitions
  - A water supply availability process is underway and must be finalized with SWFWMD. Initial project options were presented to the TAC in April 2020.
- Water supply availability update related to Peace Creek and Peace River:
  - The SWFWMD has recently kicked off a peer review of its Draft Lower Peace River/Lower Shell Creek MFL reevaluation report. The reevaluation report presents changes to the existing MFL, and of particular interest to the PRWC, limits the application of a 400 cfs (258 MGD) daily withdrawal cap to withdrawals from the Lower Peace River only. PRWC's withdrawals will fall outside of this area, and therefore PRWC is not restricted by this MFL. This restriction differs from that presented during the litigation related to the Peace River Manasota Regional Water Supply Authority WUP. It is anticipated that this finding will have a positive effect on water supply availability.

RECOMMENDATION

From:	Angel Martin
To:	Doug Leeper
Subject:	RE: SWFWMD WebBoards Digest--Information and Question
Date:	Tuesday, April 21, 2020 3:23:12 PM

Received the subject email for the WebBoard notification. Thanks for the notification. I did not receive an invitation for the subject meeting on Monday (April 20) and had not checked the Web site since the middle of last week to see if there was a meeting notification—that is why I did not participate. I assume that the meeting was open to the public? Let me know if there are any questions concerning my comments or need any additional information.

Angel

____

Angel Martin

From: noreply@discussion.community [mailto:noreply@discussion.community] **On Behalf Of** SWFWMD WebBoards
Sent: Tuesday, April 21, 2020 4:31 AM
To: amartin217@tampabay.rr.com
Subject: SWFWMD WebBoards Digest

Hi amartin217,

Here are the top topics at SWFWMD WebBoards since last week.

- **Peer Review Panel Teleconference - April 20, 2020**
  Started by Doug Leeper in Minimum Flows for the Lower Peace River and Lower Shell Creek

Thank you,
SWFWMD WebBoards
https://swfwmd.discussion.community

This digest is sent when you haven't visited the forum in over a week. If you'd rather not receive future emails, you can unsubscribe.

From:	Doug Leeper
To:	Angel Martin
Bcc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak; Chris Zajac; Randy Smith; Eric DeHaven; Adrienne E. Vining; Mike R. Bray; Owen Thornberry; April D. Breton
Subject:	RE: SWFWMD WebBoards Digest--Information and Question
Date:	Tuesday, April 21, 2020 3:52:00 PM

Angel:

- Sorry you were missed the Lower Peace/Shell Creek minimum flows peer review panel teleconference yesterday.
- For your information, I just posted a draft summary for the meeting to the webforum.
- All scheduled peer review panel meetings are open to the public. The remaining meetings are scheduled for 4/27, 6/8 and 6/22. Note that the meetings are listed in the District calendar.
  - https://www.swfwmd.state.fl.us/about/calendar
- Thanks again for your previous comments and look forward to your continued participation in the process.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Angel Martin <amartin217@tampabay.rr.com>
Sent: Tuesday, April 21, 2020 3:23 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
Subject: RE: SWFWMD WebBoards Digest--Information and Question

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- **Peer Review Panel Teleconference - April 20, 2020**
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Thank you,
SWFWMD WebBoards
https://swfwmd.discussion.community

This digest is sent when you haven't visited the forum in over a week. If you'd rather not receive future emails, you can unsubscribe.

From:	Yonas Ghile
To:	Richard Anderson
Cc:	Mike Coates; Eric DeHaven; Terri Holcomb; Doug Leeper; Chris Zajac; Randy Smith
Subject:	RE: Peace River coordination meeting
Date:	Tuesday, April 21, 2020 1:43:40 PM
Attachments:	PRMRWSA evaluation_Anderson.xlsx MFL Diversion Tables Comparison APR2020_YG.xls

Hi Richard

Most of formulas in the table capture the flow reduction calculation recommended by the District. Please consider the minor corrections provided below for question 1. For reference, I am attaching the District's version and District reviewed PRMRSWA's spreadsheet as well.

1. the attached Excel spreadsheet shows our current operational withdrawal schedule under the existing permit for Blocks 1,2 and 3. (I did not include the date ranges at this point.) To the right, I created a new withdrawal or diversion schedule based on the allowable flow reductions on your slide #9. If possible, can you confirm that our understanding of the flow reductions is represented by my formulas in the table?
    a. *In the existing operation schedule table, B2 withdrawal rate is 28% and Block withdrawal rate is 38%. If the plan is to compare the existing and proposed MFL allowable withdrawals, the B2 withdrawal rate need to be changed to 29%. If you trying to compare the permitted withdrawal with the proposed MFL allowable withdrawals, the B3 withdrawal rate has to be changed to 28%. However, I don't recommend doing the latter one as the permit withdrawal rate is unknown under the proposed MFLs.*
    b. *Block 2 and Block 3 withdrawal rates need to be adjusted to B1 withdrawal rate when the flows fall below 625 cfs in the existing operation schedule table, please see my formulas in the attached file.*
    c. *The addition of 39 cfs in B2 and 143 cfs in B3 are need to be replaced by (remaining flow) * 0.13 and (remaining flow)* 0.23 respectively. This will slightly allow more withdrawals. Please check my formulas.*
    d. *I haven't seen the 400 cfs daily maximum limit in the table but this could be due to the fact that the current pumping capacity is lower than 400 cfs.*

2. Can you provide the background data for the Allowable Withdrawals comparison you show on your Slide #11? Impacts of Proposed Minimum Flows to PRMRWSA. What period of record did you use? Is that a long term monthly average flow or did you model that? Any data you can share to help us evaluate the new schedule will be helpful.
   The impact assessment model was run from 1975 through 2018, to be consistent with the PRWC model. Yes, the withdrawal rates (slide 11) indicate the long term monthly rate under the existing and proposed minimum flows.

Please let me know if you have any question.

Best Regards
Yonas

From: Richard Anderson <randerson@regionalwater.org>
Sent: Thursday, April 9, 2020 4:08 PM
To: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>
Cc: Mike Coates <mcoates@regionalwater.org>; Eric DeHaven <Eric.Dehaven@swfwmd.state.fl.us>; Terri Holcomb <tholcomb@regionalwater.org>
Subject: RE: Peace River coordination meeting

Good afternoon Yonas,

Thanks for the presentations yesterday, I have a couple questions regarding the minimum flows.

1. the attached Excel spreadsheet shows our current operational withdrawal schedule under the existing permit for Blocks 1,2 and 3. (I did not include the date ranges at this point.) To the right, I created a new withdrawal or diversion schedule based on the allowable flow reductions on your slide #9. If possible, can you confirm that our understanding of the flow reductions is represented by my formulas in the table?

2. Can you provide the background data for the Allowable Withdrawals comparison you show on your Slide #11? Impacts of Proposed Minimum Flows to PRMRWSA. What period of record did you use? Is that a long term monthly average flow or did you model that? Any data you can share to help us evaluate the new schedule will be helpful.

Regards,

Richard Anderson
System Operations Manager
Peace River Manasota Regional Water Supply Authority
8998 SW CR 769
Arcadia, FL 34269

O-863-993-4565
C-941-806-9967

-----Original Appointment-----
From: Yonas Ghile <Yonas.Ghile@swfwmd.state.fl.us>
Sent: Monday, April 6, 2020 7:07 PM
To: Chris Zajac; Doug Leeper; Eric DeHaven; Lei Yang; Jay Hoecker; John F. Ferguson; Randy Smith; George A. Schlutermann; Darrin Herbst; April D. Breton; Mary Thomas; Dale Helms; Elizabeth Perez; Derick.Hopkins@wright-pierce.com; Gene Heath; ghubbard@mywinterhaven.com; peter.hernandez@wright-pierce.com; tom.simbro@wright-pierce.com; Jennette Seachrist; Cindy C. Rodriguez; James Guida; Kathleen Gierok; Mike Britt, P.E. (mbritt@mywinterhaven.com); Mike Coates; Patrick Lehman; Owen Thornberry; Patrick Tara; RyanTaylor@PRWCWater.org; Robert Beltran; Richard Anderson

Subject: Peace River coordination meeting
When: Wednesday, April 8, 2020 1:30 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

Hi all,

From our experience, we found that Microsoft Teams is more reliable than Skype. The Peace River Coordination meeting will be held in Teams. If anyone else needs an invite, please forward. Attached is a copy of my presentation (Lower Peace River minimum flows).

The agenda is as follows unless anyone has any additions:

1. Discuss Upper Peace Model – Lei Yang to present District review (90 minutes)
    a. Questions/discussion
    b. Next steps forward
2. Overview of Lower Peace MFL Reevaluation – Yonas Ghile to present (30 minutes)
    a. Questions/discussion

Thanks.

Join Microsoft Teams Meeting

+1 786-749-6127 United States, Miami (Toll)

Conference ID: 113 106 442#

Local numbers | Reset PIN | Learn more about Teams | Meeting options

INTERNAL USERS: Please use headset and microphone to join meeting audio. EXTERNAL USERS: Please dial toll # or use headset and microphone to join meeting audio.

From:	Angel Martin
To:	Doug Leeper
Subject:	Lower Peace River/Lower Shell Creek--Comments
Date:	Monday, April 27, 2020 3:20:31 PM

As per the teleconference on April 27, 2020, concerning minimum flows for the Lower Peace River and Lower Shell Creek, below are a couple of questions/comments for consideration.

1. Consider adding a sentence or two indicating that new climate change information/data will be considered in possible future analyses. It was indicated in the peer review process that more up-to-date climate information was available from the information initially considered in the analysis.
2. Suggest adding a conversion table, water-quality units, and vertical datum definition to the document. An example is given below. Please note that there are two examples given for Datums. Only the factors, units, and datums used in the document are needed to be shown.

Please contact me if you need any additional information or clarification. Thank you for the opportunity to comment on the subject document.

Conversion factors, water-quality units, and vertical datums

This report uses English and metric units. To determine equivalent metric values from English values, multiply the English values by the conversion factors listed below. To determine equivalent English values from metric values, divide the metric values by the conversion factors listed below.

Multiply	By	To Obtain
	Length	
inch (in.)	25.4	millimeter (mm)
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	4,047	square meter (m^2)
square foot (ft^2)	0.09290	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	3.785	liter (L)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
	Flow	
inch per year (in/yr)	25.4	millimeter per year (mm/yr)
foot per year (ft/yr)	0.3048	meter per year (m/yr)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
gallon per minute (gal/min)	0.06308	liter per second (L/s)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
billion gallons per day (Bgal/d)	43.81	cubic meter per second (m^3/s)

Temperature is given in degree Celsius (°C), which can be converted to degree Fahrenheit (°F) by the following equation: °F = 1.8 (°C) + 32

Water-Quality Units

Abbreviations:

grams per cubic centimeter (g/cm^3)
milligrams per liter (mg/L)
parts per million (ppm)
parts per thousand (ppt)

Conversions: Most chemical concentrations in this report are given in milligrams per liter, which is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. A few of the chemical concentrations are given as parts per thousand or parts per million; these are units of weight of solute per weight of water. Parts per thousand (that is, grams of solute per kilogram of water) is a concentration that is often used in reporting the composition of seawater. Concentration expressed as parts per million (that is, milligrams of solute per kilogram of water) can be converted to milligrams per liter by multiplying the concentration by the density of water, in kilograms per liter. At low concentrations, such as that of freshwater, concentrations expressed as parts per million are nearly equal to those expressed as milligrams per liter.

Vertical Datums

Because this report is based on a large number of previously published scientific investigations, "sea level" is not referenced to a single vertical datum. "Mean sea level" also is not used with reference to a single datum; where used, the phrase means the average surface of the ocean as determined by calibration of measurements at tidal stations. The vertical datum used for each investigation described in this report is identified where it could be determined from the published sources of information.

Datums

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88). Vertical coordinate information for historical data collected and stored as National Geodetic Vertical Datum of 1929 (NGVD 29) has been converted to NAVD 88 for this publication. Conversion between NAVD 88 and the commonly used NGVD 29 varies spatially; however, over most of the study area the following conversion can be used:
NGVD 29 = NAVD 88 –3.6 feet.

This conversion generally is accurate within about ± 0.5 feet for 95 percent of the study area. The reader is directed to either the National Geodetic Survey Web site for VERTCON at http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html or the U.S. Army Corps of Engineers Web site for at http://crunch.tec.army.mil/software/corpscon/corpscon.html for more accurate conversions.

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83). Horizontal coordinate information for historical data collected and stored as North American Datum of 1927 (NAD 27) has been converted to NAD 83 for this publication. Conversion between NAD 83 and the commonly used NAD 27 varies spatially, and the difference in lateral positions can be greater than 300 feet. For assistance with conversions, the reader is directed to either the National Geodetic Survey Web site for NADCON at http://www.ngs.noaa.gov/TOOLS/Nadcon/Nadcon.html or the U.S. Army Corps of Engineers Web site at http://crunch.tec.army.mil/software/corpscon/corpscon.html.

Elevation, as used in this report, refers to distance above the vertical datum.

Angel Martin
813-767-6944

From:	Doug Leeper
To:	Angel Martin
Cc:	Yonas Ghile; Xinjian Chen; Chris Anastasiou; Kristina Deak
Subject:	RE: Lower Peace River/Lower Shell Creek--Comments
Date:	Monday, April 27, 2020 3:38:00 PM

Thanks, Angel. As discussed, I will post your comments to the peer review webforum.

Doug Leeper
MFLs Program Lead
Environmental Flows and Assessments Section
Natural Systems & Restoration Bureau
Southwest Florida Water Management District
2379 Broad Street (U.S. Hwy. 41 South)
Brooksville, FL 34604-6899
352-796-7211, Ext. 4272
1-800-423-1476, Ext. 4272
Doug.leeper@watermatters.org

From: Angel Martin <amartin217@tampabay.rr.com>
Sent: Monday, April 27, 2020 3:20 PM
To: Doug Leeper <Doug.Leeper@swfwmd.state.fl.us>
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This conversion generally is accurate within about ± 0.5 feet for 95 percent of the study area. The reader is directed to either the National Geodetic Survey Web site for VERTCON at http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html or the U.S. Army Corps of Engineers Web site for at http://crunch.tec.army.mil/software/corpscon/corpscon.html for more accurate conversions.
Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83). Horizontal coordinate information for historical data collected and stored as North American Datum of 1927 (NAD 27) has been converted to NAD 83 for this publication. Conversion between NAD 83 and the commonly used NAD 27 varies spatially, and the difference in lateral positions can be greater than 300 feet. For assistance with conversions, the reader is directed to either the National Geodetic Survey Web site for NADCON at http://www.ngs.noaa.gov/TOOLS/Nadcon/Nadcon.html or the U.S. Army Corps of Engineers Web site at http://crunch.tec.army.mil/software/corpscon/corpscon.html.
Elevation, as used in this report, refers to distance above the vertical datum.

Angel Martin
813-767-6944

DL

Moderator
96 posts

Doug Leeper
a few seconds ago

Written comments submitted by Mr. Angel Martin to Doug Leeper on 4/27/2020 based on oral comments provided during the 4/27/2020 peer review panel teleconference.

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As per the teleconference on April 27, 2020, concerning minimum flows for the Lower Peace River and Lower Shell Creek, below are a couple of questions/comments for consideration.

1. Consider adding a sentence or two indicating that new climate change information/data will be considered in possible future analyses. It was indicated in the peer review process that more up-to-date climate information was available from the information initially considered in the analysis.
2. Suggest adding a conversion table, water-quality units, and vertical datum definition to the document. An example is given below. Please note that there are two examples given for Datums. Only the factors, units, and datums used in the document are needed to be shown.

Please contact me if you need any additional information or clarification. Thank you for the opportunity to comment on the subject document.

Conversion factors, water-quality units, and vertical datums

This report uses English and metric units. To determine equivalent metric values from English values, multiply the English values by the conversion factors listed below. To determine equivalent English values from metric values, divide the metric values by the conversion factors listed below.

Multiply	By	To Obtain
	Length	
inch (in.)	25.4	millimeter (mm)
inch (in.)	2.54	centimeter (cm)
foot (ft)	0.3048	meter (m)
mile (mi)	1.609	kilometer (km)
	Area	
acre	4,047	square meter (m^2)
square foot (ft^2)	0.09290	square meter (m^2)
square mile (mi^2)	2.590	square kilometer (km^2)
	Volume	
gallon (gal)	3.785	liter (L)
cubic foot (ft^3)	0.02832	cubic meter (m^3)
	Flow	
inch per year (in/yr)	25.4	millimeter per year (mm/yr)
foot per year (ft/yr)	0.3048	meter per year (m/yr)
cubic foot per second (ft^3/s)	0.02832	cubic meter per second (m^3/s)
gallon per minute (gal/min)	0.06308	liter per second (L/s)
million gallons per day (Mgal/d)	0.04381	cubic meter per second (m^3/s)
billion gallons per day (Bgal/d)	43.81	cubic meter per second (m^3/s)

Temperature is given in degree Celsius (°C), which can be converted to degree Fahrenheit (°F) by the following equation: °F = 1.8 (°C) + 32

Water-Quality Units

Abbreviations:
grams per cubic centimeter (g/cm^3)
milligrams per liter (mg/L)
parts per million (ppm)
parts per thousand (ppt)

Conversions: Most chemical concentrations in this report are given in milligrams per liter, which is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. A few of the chemical concentrations are given as parts per thousand or parts per million; these are units of weight of solute per weight of water. Parts per thousand (that is, grams of solute per kilogram of water) is a concentration that is often used in reporting the composition of seawater. Concentration expressed as parts per million (that is, milligrams of solute per kilogram of water) can be converted to milligrams per liter by multiplying the concentration by the density of water, in kilograms per liter. At low concentrations, such as that of freshwater, concentrations expressed as parts per million are nearly equal to those expressed as milligrams per liter.

Vertical Datums

Because this report is based on a large number of previously published scientific investigations, "sea level" is not referenced to a single vertical datum. "Mean sea level" also is not used with reference to a single datum; where used, the phrase means the average surface of the ocean as determined by calibration of measurements at tidal stations. The vertical datum used for each investigation described in this report is identified where it could be determined from the published sources of information.

Datums

Vertical coordinate information is referenced to the North American Vertical Datum of 1988 (NAVD 88). Vertical coordinate information for historical data collected and stored as National Geodetic Vertical Datum of 1929 (NGVD 29) has been converted to NAVD 88 for this publication. Conversion between NAVD 88 and the commonly used NGVD 29 varies spatially; however, over most of the study area the following conversion can be used:

NGVD 29 = NAVD 88 −3.6 feet.

This conversion generally is accurate within about ± 0.5 feet for 95 percent of the study area. The reader is directed to either the National Geodetic Survey Web site for VERTCON at http://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html or the U.S. Army Corps of Engineers Web site for at http://crunch.tec.army.mil/software/corpscon/corpscon.html for more accurate conversions.

Horizontal coordinate information is referenced to the North American Datum of 1983 (NAD 83). Horizontal coordinate information for historical data collected and stored as North American Datum of 1927 (NAD 27) has been converted to NAD 83 for this publication. Conversion between NAD 83 and the commonly used NAD 27 varies spatially, and the difference in lateral positions can be greater than 300 feet. For assistance with conversions, the reader is directed to either the National Geodetic Survey Web site for NADCON at http://www.ngs.noaa.gov/TOOLS/Nadcon/Nadcon.html or the U.S. Army Corps of Engineers Web site at http://crunch.tec.army.mil/software/corpscon/corpscon.html .

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Angel Martin

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