6. WORKSHOP ON WATERSHED RESERVOIRS UPDATE: FINAL DETAILS

Final preparations are being made for the "Workshop on Watershed Reservoirs: Locations, Effects and Solutions" to be hosted by the CHNEP April 13-14 in Punta Gorda. The final agenda and abstracts for the workshop are attached. The background reading material and review questions are available on the CHNEP ftp site in the TAC April 8, 2009 Meeting folder at:

Address for CHNEP ftp site: ftp://ftp.swfrpc.org
User name: chnep
Password: chnepaccess
Folder: TAC 4-8-09

The workshop is an FY09 Workplan activity and implements the CHNEP CCMP 2008 Update Priority Action HA-K: Identify the hydrologic and environmental impacts of surface water reservoirs on estuaries within the watershed. The purpose of the workshop is to provide a forum for the exchange of technical information between scientists and citizens about the location, design, benefits and impacts of existing and proposed reservoirs on freshwater, estuarine and groundwater water quality, hydrology and habitats within the CHNEP watershed.

The Reservoir Workshop subcommittee, comprised of TAC and CAC members, assisted with developing the workshop goals and topics. Florida Conflict Resolution Consortium has been contracted to assist with developing and facilitating the workshop.

The workshop is being held at the Charlotte County Event and Conference Center. The workshop is free and over 75 participants registered. Several organizations are providing sponsorship for the workshop. Pre-workshop activities for participants include an interest survey, background reading materials and reading review questions. Facilitated exercises following each agenda session, which will foster discussion between workshop participants. A final report of the workshop results will be prepared, including technical findings, facilitated discussions and recommended actions needed to ensure consistency of future reservoirs with the CHNEP CCMP.

Recommendation: None Requested. Informational only.

Attachment: Workshop on Watershed Reservoirs: Locations, Effects and Solutions Agenda
Workshop Abstracts
Workshop Background Reading and Review on ftp site

CHARLOTTE HARBOR NATIONAL ESTUARY PROGRAM
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Workshop on Watershed Reservoirs: Locations, Effects and Solutions
April 13-14, 2009 in Punta Gorda, Florida

OVERVIEW

Workshop Purposes:
- Begin a process to bring public and private stakeholders together to inform and educate the community regarding reservoirs within the CHNEP watershed.
- Provide a forum for the exchange of technical information between scientists and citizens about the locations, purposes, designs, benefits, impacts, alternatives and solutions for existing and proposed reservoirs on freshwater, estuarine and ground water quality, hydrology and habitats in the CHNEP watershed.
- Implement the CHNEP CCMP Priority Action to Identify the hydrologic and environmental benefits and impacts of surface water reservoirs on estuaries within the CHNEP watershed (HA-K).

Workshop Objectives:
- Facilitate understanding of current natural resource and human water budget needs and relationship to reservoirs within CHNEP watershed.
- Facilitate understanding of the locations of existing and proposed reservoirs within CHNEP watershed.
- Facilitate understanding of the need, purposes, designs and management options of reservoirs within the CHNEP watershed.
- Facilitate understanding of the potential individual and cumulative habitat, water quality and hydrological benefits and impacts of existing and proposed reservoirs within the CHNEP watershed.
- Develop recommendations for needed reservoir review criteria, research, public education, policies and strategies within the CHNEP watershed.

Workshop Outcomes Available on CHNEP Website at www.chnep.org:
- Compiled background information about reservoirs in the CHNEP watershed to review before the workshop.
- Maps of existing and proposed reservoirs within the CHNEP Watershed.
- List of needs, purposes, designs and management options for reservoirs within the CHNEP Watershed.
- List of studies, methods and models used to evaluate benefits and impacts of reservoirs.
- Lists of benefits and impacts of reservoirs on habitats, water quality and hydrology, including estuaries.
- Lists of potential cumulative benefits and impacts of reservoirs within the CHNEP watershed.
- Lists of processes and criteria used, and research needed, to evaluate current and potential benefits and impacts of reservoirs.
- List of criteria to be used in evaluating reservoirs and ideas for implementing.
- List of additional research needed and ideas for implementing.
- List of suggested policy changes needed and ideas for implementing.
- List of public outreach and education strategies and ideas for implementing.
- List of remaining issues needing problem solving or conflict resolution and ideas for implementing.
- Final Report of workshop technical presentation and facilitated discussion results available by September 2009.

Facilitators:
Mr. Rafael Montalvo - Florida Conflict Resolution Consortium, University of Central Florida
Mr. Tom Taylor - Florida Conflict Resolution Consortium, University of Florida

Peer Reviewers:
Dr. Ernst Peebles - Biologist, University of South Florida College of Marine Sciences
Mr. Arturo Torres - Hydrologist, USGS Florida Integrated Science Center
Dr. Sam Upchurch - Geologist, SDI Global, Tampa

AGENDA
DAY 1: Monday April 13, 2009

8:00 a.m. ***Coffee and Registration***

8:15 a.m. ***Welcome, Introductions, Review Agenda and Workshop Ground Rules***
Welcome and Introductions - Lisa Beever, CHNEP
Review Agenda and Workshop Ground Rules - Rafael Montalvo and Tom Taylor, FCRC

Session I: Where are the Existing and Proposed Reservoirs within the CHNEP Watershed?

8:45 a.m. **Past, Present and Future Landscape Water Storage and Reservoirs in the CHNEP** - Lisa Beever, CHNEP

9:10 a.m. **Overview of Potential Habitat Effects Associated with Reservoirs –** Joan Browder, NOAA – Note: Dr. Browder's presentation relates to Session IV: Benefits and Impacts of Reservoirs, but it is given here to accommodate scheduling conflicts.

9:35 a.m. **Surface Water Resource Planning within the SWFWMD's Regional Water Supply Plan: Only the First Step** - Brian Armstrong, SWFWMD

10:00 a.m. **Facilitated Exercise I** - Review and refine maps and lists of existing and proposed reservoirs within CHNEP watershed.

10:30 a.m. ***Break***

Session II: What are the Need, Purposes, Designs and Management Options for Reservoirs within the CHNEP Watershed?

10:45 a.m. **Water Storage Considerations: a Case Study of an Alternative Design Plan –** Church Roberts, Johnson Engineering, Inc.

11:10 a.m. **The Role of Agricultural Reservoirs in Watershed Management** - Bill Orendorff, SWFWMD

11:35 a.m. **Design and Construction of Reservoirs in South Florida** - Less Bromwell, BCI Engineers and Scientists, Inc.

Lunch & Key Note Speaker *(lunches available for purchase on site or at nearby restaurants)*

12:00 a.m. **Lunch**

12:30 p.m. **"Water Sustainability and the Future of Florida"**– Cynthia Barnett, Florida Trend Magazine.

Session II: Continued

1:15 p.m. **Design and Construction of Earthen Reservoirs in Florida (1967-2007)** - John Garlanger, Ardaman and Associates

1:40 p.m. **Capture and Storage of Surface Water in the Peace River Basin: Above-ground vs. Underground Storage** - Peter Schreuder, Schreuder, Inc.

2:05 p.m. **Ecoreservoirs Program: EAA A-1 and C-43 CERP Alternatives** - Forest Michael, Michael Planning

2:30 p.m. **Facilitated Exercise II** - Compile list of needs, purposes, designs and management options for reservoirs within the CHNEP watershed and test for agreement on suggestions for general reservoir design and management practices.

3:00 p.m. ***Break***

Session III: What are Current Studies, Methods and Models Used to Evaluate Benefits and Impacts of Reservoirs?

3:15 p.m. **Using Hydrologic and Ecological Information to Develop Withdrawal Schedules for In-stream Impoundments and Off-stream Reservoirs in the SWFWMD** - Sid Flannery, SWFWMD

3:40 p.m. **C-43 West Basin Storage Reservoir: An Acceler8 Project's Development Process, Potential Environmental Benefits, and Calculated Impacts** - Sandy Scheda, Scheda Ecological Associates

4:05 p.m. **Physicochemical Factors Affecting Near-Bottom Dissolved Oxygen Concentration in Reservoirs in Southwest Florida -** John Cassani, LCHCD

4:30 p.m. **Facilitated Exercise III** - Compile list of studies, methods and models used to evaluate benefits and impacts of reservoirs, identify gaps in data and methods and seek concensus on general suggestions.

Day 1 Summary: What are the Technical and Facilitated Lessons Learned and Questions Remaining?

5:00 p.m. **Technical Summary** - Peer Reviewers Dr. Peebles, Mr. Torres and Dr. Upchurch
Facilitated Topics Summary - Facilitators Mr. Montalvo and Mr. Taylor

5:20 p.m. ***Adjourn for the day***

5:30 p.m. ***Social Gathering*** *(off site)*

AGENDA
DAY 2: Tuesday April 14, 2009

8:00 a.m. ***Coffee and Registration***

8:15 a.m. ***Welcome and Summary of Day 1***
Welcome - Lisa Beever, CHNEP
Technical Summary - Peer Reviewers Dr. Peebles, Mr. Torres and Dr. Upchurch
Facilitated Topics Summary - Facilitators Mr. Montalvo and Mr. Taylor

Session IV: What are the Potential Benefits and Impacts of Reservoirs?

8:40 a.m. **Potential Hydrologic and Water Quality Effects of Reservoirs** – George Kish, USGS

9:20 a.m. **The Use of Off-Stream Reservoirs Combined with Percent Flow Withdrawal Schedules to Reduce Downstream Estuarine Impacts -** Ralph Montgomery, PBS&J

9:45 a.m. **Ecological Monitoring at the C.W. Bill Young Regional Reservoir -** Christopher Shea, Tampa Bay Water

10:10 a.m. ***Mini Break***

10:20 a.m. **An Examination of the Ecological Health of Wetlands in Proximity to a Public Supply Off-Stream In-ground Reservoir in DeSoto County, Florida -** Jeffrey Clark, EarthBalance

10:45 a.m. **Facilitated Exercise IV -** Compile lists of benefits and impacts of reservoirs on habitats, water quality and hydrology on rivers, estuaries and ground water and seek consensus on suggestions for improving criteria to be considered.

11:15 a.m. ***Mini Break***

Session V: What are the Potential Cumulative Benefits and Impacts of Reservoirs within the CHNEP Watershed?

11:25 a.m. **Dead Zones, Stagnation and the Water Crisis: Watershed Effects on Estuarine Communities –** Ernst Peebles, USF

Poster Session & Lunch *(lunches available for purchase on site or at nearby restaurants)*

11:50 a.m. **Poster: When a Pile of Dirt is So Much More - Dam Safety Design Criteria -** Becky Hachenburg, MWH

Session V: Continued

1:00 p.m. **Linking Ecological Restoration with Water Supply Development using Off-Stream Reservoirs in Southwest Florida -** Dave Tomasko, PBS&J

1:25 p.m. **Environmental and Water Supply Benefits of an Off-Stream Reservoir System at the Peace River Water Supply Facility** - Sam Stone, PRMRWSA

1:50 p.m. **Site Evaluation Study for Potential Raw Water Off-Line Regional Reservoir Storage Facility –** Gary Wantland, MWH Americas, Inc.

2:15 p.m. **Facilitated Exercise V –** Compile lists of potential cumulative benefits and impacts of reservoirs within the CHNEP watershed and seek consensus general suggestions for determining cumulative benefits and impacts.

2:45 p.m. ***Break***

Session VI: What Processes and Criteria are Used to Evaluate Current and Potential Benefits and Impacts of Reservoirs within the CHNEP Watershed?

3:00 p.m. **Overview of FDEP Regulations and Criteria Used to Evaluate Proposed Reservoir Projects –** Elizabeth Gillen, FDEP

3:20 p.m. **Considerations in the Evaluation of Environmental Resource Permit and Water Use Permit Applications for Borrow Pit Construction in the Southwest Florida Water Management District–** Jennifer Brunty, SWFWMD

3:40 p.m. **Overview of USACE Regulations and Criteria Used Evaluate Proposed Reservoir Projects –** Susan Blass or Skip Berman, USCOE (invited)

Session VII: What Additional Review Criteria, Research, Policies and Strategies are Needed to Assure Existing and Potential Reservoirs in the CHNEP Watershed are Consistent with the CCMP?

4:00 p.m. **Facilitated Exercise VII -** Compile list of needed review criteria, research and policy changes and remaining problems to be resolved through problem solving and consensus building.

Workshop Summary: What Lessons have we Learned, What Remain and What Steps are Next?

4:45 p.m. **Technical Summary** - Peer Reviewers Dr. Peebles, Mr. Torres and Dr. Upchurch
Facilitated Topics Summary - Facilitators Mr. Montalvo and Mr. Taylor

5:05 p.m. ***Closing and Adjourn the Workshop***
Thank You - Lisa Beever, CHNEP

Armstrong et al, *Surface Water Resource Planning within the SWFWMD's Regional Water Supply Plan: only the first step*

Workshop Topic: Where are the Existing and Proposed Reservoirs Located within the CHNEP Watershed.

Preference: Oral presentation

Title: Surface Water Resource Planning within the SWFWMD's Regional Water Supply Plan: only the first step

Authors: Brian Armstrong, P.G., SWFWMD, and Lisann Morris, SWFWMD

Primary Contact: Brian Armstrong, Southwest Florida Water Management District, 2379 Broad Street, Brooksville, FL 34604-6899/Phone 352-796-7211/ brian.armstrong@swfwmd.state.fl.us

Presenter: Brian Armstrong, P.G, Manager, Water Supply and Resource Development Section, SWFWMD.

Abstract: The Southwest Florida Water Management District is responsible for managing and protecting water resources in west-central Florida. The District's job is to ensure adequate water supplies to meet the needs of current and future users while protecting water and related natural resources. The District encompasses all or part of 16 counties, from Levy County in the north to Charlotte County in the south. It extends from the Gulf of Mexico east to Polk and Highlands counties. The District contains 98 local governments spread over approximately 10,000 square miles, with total population in 2007 of more than 4.5 million people.

Chapter 373.0361 Florida Statutes (F.S.) requires the Southwest Florida Water Management District (District) to conduct water supply planning for any planning region within the District where existing sources of water are not adequate for all current and future reasonable-beneficial uses including related natural systems. The role of the District's Regional Water Supply Plan is to provide the framework for future water resource decisions within those planning regions. The Regional Water Supply Plan assesses projected water demands and potential sources of water to meet demands for a minimum of a 20 year planning period. With respect to potable water, surface water reservoirs are one of the major "tools in the toolbox" to provide sustainable water for Florida's future.

Working within the context of the Regional Water Supply Plan, this presentation will explain how conceptual estimates of potential surface water availability are determined (what water could be withdrawn for storage within a reservoir), leading to how surface water options for water supply development are evaluated\developed in past plans and what is proposed for next year's update. Also discussed will be current potable reservoirs within the District and current potable reservoirs under development within the CHNEP watersheds along with statutory water supply planning requirements for water supply entities and local municipalities connected to the RWSP.

Beever et al, *What are Reservoirs and Where have Alternative Reservoir Sites been Identified within the CHNEP Watershed?*

Abstract for CHNEP Reservoir Workshop

Topic: Definition of Reservoirs for Workshop; Locations of Existing and Proposed Reservoirs in the CHNEP Watershed

Oral or Poster Presentation Preference: Presentation

Title of Presentation: Pending/What are Reservoirs and Where have Alternative Reservoir Sites been Identified within the CHNEP Watershed?

Authors' Names & Affiliations: Lisa Beever, CHNEP and Judy Ott, CHNEP

Primary Author's Contact Information: lbeever@swfrpc.org; (239) 338-2556

Presenter's Name: Lisa Beever

Abstract:
Lisa's presentation will address the following:

- How have we defined reservoirs for this workshop?
- What are the findings from past workshops on land management and water budgets that relate to these discussions about reservoirs?
- What landscape scale changes have occurred in wetlands, open water and water storage related to reservoirs?
- Where are the existing reservoirs within the CHNEP watershed?
- Where are the proposed reservoirs within the CHNEP watershed?

Bromwell, *Design & Construction Issues for Reservoirs in South Florida*

PROPOSAL FOR PRESENTATION for CHNEP Reservoir Workshop BY: LES BROMWELL, Sc.D., P.E.

RELATED WORKSHOP TOPIC: ALTERNATIVE MANAGEMENT OPTIONS & RESERVOIR DESIGNS

TITLE OF PRESENTATION: DESIGN & CONSTRUCTION ISSUES FOR RESERVOIRS IN SOUTH FLORIDA

AUTHORS NAME: LES BROMWELL, Sc.D., P.E., PRINCIPAL ENGINEER

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PRESENTERS NAME: LES BROMWELL

ABSTRACT:

Florida's geologic and hydrologic settings provide many challenges for constructing safe and efficient water storage facilities. But given Florida's ever-increasing demands for fresh water, additional storage of generally abundant rainwater must be provided. Large-scale reservoirs generally require earth dams to provide impoundment. For many reasons, such dams have been rare in south Florida's past. The relatively flat topography of south Florida does not offer many opportunities for in-stream dam construction. Suitable natural materials for construction are frequently limited to fine sands, which are not the best dam building materials. Geologic conditions, including high porosity and potential sinkholes, can limit site selection, as can wetlands, existing infrastructure, and land availability. All of these limitations can make reservoirs expensive, difficult to permit, and challenging to design and build.

Nonetheless, the imperative to conserve fresh water in order to provide adequate supplies for restoring and maintaining healthy habitat, and meeting supply needs for domestic consumption, agriculture and industry, require a variety of engineered systems, including surface reservoirs, ground water reservoirs, waste water recovery, and desalination. In this mix, surface reservoirs are generally the least expensive and most effective means of capturing and storing much of the 1.7 billions gallons of fresh water discharged to tide every day in south Florida.

The need for additional storage of rainwater was recognized in the planning of the Comprehensive Everglades Restoration Program (CERP), which has been termed "Re-engineering Water Storage in the Everglades" by the National Academy of Sciences. The Corps Central & South Florida Project, initiated following disastrous hurricanes in 1947, has constructed over 1800 miles of levees and canals, and more than 200 water control structures in south Florida. The net result is over-drainage, severe environmental degradation, and inadequate water supplies for humans, animals, and plants. To begin correcting the problem, CERP calls for 14 major new reservoirs, plus numerous smaller impoundments. These reservoirs will store excess stream/canal flows during the rainy season, and release water to filter marshes (Stormwater Treatment Areas) to help restore the natural system's water quality and hydroperiod.

The history of reservoir construction in south Florida will be discussed, along with examples of inadequate engineering and resulting failures. Site-specific examples of design challenges and how they were met will be presented. These include the Lake Manatee Dam and Reservoir, FPL Indiantown Reservoir, Tampa Bay Water Reservoir, and several CERP reservoir projects including Ten Mile Creek, Loxahatchee L-8, C-44, EAA, and Acme Basin B. The presentation will also include innovative reservoir applications including those located in former phosphate and limestone mines. All of the case studies are from the author's own engineering involvement.

Finally the paper will look to the future to discuss the role of reservoirs in providing long-term water supplies for the future growth and environmental health of south Florida.

Brunty, Jennifer, ***Considerations in the Evaluation of Environmental Resource Permit and Water Use Permit Applications for Borrow Pit Construction in the Southwest Florida Water Management District***

Topic: Processes and Criteria Used to Evaluate Current and Potential Benefits and Impacts of Reservoirs Within the CHNEP Watershed

Presentation Type: Oral presentation

Title of Presentation: Considerations in the Evaluation of Environmental Resource Permit and Water Use Permit Applications for Borrow Pit Construction in the Southwest Florida Water Management District

Authors and Presenter Contact Information:
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Presenter: Same as above.

Abstract: The purpose of this presentation is to give the audience an overview of the technical criteria considered by environmental scientists, engineers and hydrologists in the review of Environmental Resource Permit (ERP) and Water Use Permit (WUP) applications related to the excavation of borrow pits. The Southwest Florida Water Management District (District) may evaluate one or both of these types of applications depending on the specific circumstances of the proposed excavation. The District processes the ERP application when no mining of minerals (e.g. phosphate) or sorting and grading activities are proposed, otherwise, the Department of Environmental Protection (Department) will process the ERP application. The primary environmental considerations evaluated in the ERP application process may include reduction and elimination (a.k.a. avoidance and minimization) of adverse wetland impacts, whether direct or indirect, wetland monitoring, and mitigation for impacts that could not be reduced and/or eliminated. Some engineering considerations may include, but are not limited to, pre- versus post- discharge rates and basins, soil borings to provide assurance that excavation will not breach an aquitard or come within two feet of bedrock, water quality treatment, design storm event (25-year versus 100-year), side slopes, sediment and erosion control, floodplain impacts (not just the berm but any floodplain access blocked by the berm), and emergency overflows during and after construction. A Mining/Dewatering WUP is almost always necessary when the mine will be dewatered during excavation, but is not likely to be required if the borrow pit will be excavated "wet" with a hydraulic dredge. WUPs are always reviewed by the District, regardless of whether the ERP was issued by the District or Department. A WUP cannot be issued in this case until the ERP has been deemed complete. Some environmental considerations evaluated during the WUP application process include determination of water level drawdowns in wetlands and other surface water features as a result of dewatering and development of a wetland and/or water level monitoring plan. The potential for drawdown is determined through groundwater modeling conducted by hydrologists and may be addressed through the use of a recharge trench. The quantity of water on the water use permit will be the water entrained in the product, which is generally minimal; however, the primary focus of the hydrologist review is the potential for adversely impacting water levels surrounding the excavation.

Cassani et al, *Physicochemical Factors Affecting Near-Bottom Dissolved Oxygen Concentration in Reservoirs of Southwest Florida.*

PROPOSAL TO PRESENT: Workshop on Reservoirs in the Charlotte Harbor Watershed

RELATED TOPICS: Impact of reservoirs on water quality and implications of reservoir design for various uses particularly stormwater. The same water quality principles apply to other designated uses where discharge could impact offsite water quality.

FORMAT PREFERENCE: Oral presentation.

TITLE: Physicochemical Factors Affecting Near-Bottom Dissolved Oxygen Concentration in Reservoirs of Southwest Florida.

AUTHORS: John R. Cassani (Lee County Hyacinth Control District), Kevin Watts (Lee County Hyacinth Control District), Edwin M. Everham, III (Florida Gulf Coast University), David W. Ceilley (Florida Gulf Coast University).

PRIMARY CONTACT: John Cassani, Lee County Hyacinth Control District, P.O. Box 60005, Ft. Myers, FL 33906. 239-690-5718. jcassani@comcast.net

PRESENTER: John Cassani

ABSTRACT: Near-bottom dissolved oxygen concentration (NBDO) was monitored bi-monthly at one site for four years and 10 additional sites during late summer of 2007 and 2008 in Lee County, Florida to determine the influence of reservoir morphometry on NBDO dynamics. Maximum depth, surface to volume ratio, fetch distance, relative depth ($Z_{r,}$) and specific conductance were assessed individually on NBDO using linear regression analysis. A significant ($p < 0.05$) inverse relationship ($r^2 = 0.549$) existed between NBDO and maximum depth during late summer of 2007 at eleven sites but not again in 2008 at the same sites, suggesting factors other than maximum depth may be important in regulating NBDO in relatively shallow reservoirs of coastal southwest Florida. Relatively strong but non significant ($p < 0.08$) relationships occurred between NBDO and surface / volume ratio (direct relationship) and east-west fetch distance (inverse relationship) in 2007, but as with maximum depth, not again in 2008. Relative depth Z_r was found to be a poor predictor of NBDO in the reservoirs we sampled. An additional finding revealed that a narrow, more dense layer of water as measured by sharply elevated specific conductance near the soil water interface was negatively correlated with NBDO at two sites more proximal to the Gulf of Mexico and saltwater intrusion via groundwater is suspected to contribute to this condition. The influence of submersed aquatic vegetation (SAV) on NBDO was also examined at one site during four growth seasons, indicating the presence of extensive SAV may resist vertical mixing and contribute to relatively low NBDO. These findings will contribute a greater understanding of how reservoir morphometry in southwest Florida may affect NBDO which has a major influence on nutrient dynamics at the sediment water interface, the distribution of biota within reservoirs and the potential for affecting off-site waters resulting from reservoir discharge.

Clark, ***An Examination of the Ecological Health of Wetlands in Proximity to a Public Supply Off-stream In-ground Reservoir in DeSoto County, Florida***

Title of Presentation: An Examination of the Ecological Health of Wetlands in Proximity to a Public Supply Off-stream In-ground Reservoir in DeSoto County, Florida

Workshop Topic: What are the wetland impacts from the operation of a public water supply off-stream in-ground reservoir?

Type of Presentation: Oral presentation with PowerPoint.

Author & Presenter:
Jeffrey L. Clark, MS, PMP
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Abstract
From 1998-2006, the Peace River Manasota Regional Water Supply Authority (Authority) conducted hydrologic and vegetative monitoring of five wetlands on the R.V. Griffin Reserve as part of the Peace River Facility Aquifer Storage and Recovery (ASR) wellfield system. The purpose of this project was to examine the ecologic effects of the ASR wellfield system operations on those wetlands. The conclusion of that program was that ASR operations did not negatively impact nearby wetlands.

The existing data were evaluated for possible wetland impacts from the existing off-stream in-ground reservoir operations. The monitored wetlands range in distance from 650 to 8,450 feet from the Authority's existing reservoir. Hydrologic monitoring data indicate an overall high correlation between water levels in reference and indicator wetlands (Pearson's $r \geq 0.85$). In addition, the water levels in the monitored wetlands generally correspond to the amount of rainfall, as well as to the length of time between rainfall events. Hydrographs illustrate the influence of rainfall on the ground-water levels in the monitored wetlands. No significant deviations from baseline hydrologic conditions were identified during the eight years of monitoring. However, regression analyses show that Wetland No. 117, which is the closest wetland to the reservoir, consistently has the weakest correlation with reference wetlands during the study. This weak correlation suggests that some other confounding factor may have influenced hydrologic levels in this wetland. Hydrographs of reservoir and wetland water levels were evaluated to determine if reservoir operations may have affected hydrologic conditions in Wetland No. 117. Annual vegetative monitoring events from 1998 to 2005 show a fairly consistent percent coverage by dominant wetland vegetation within each of the wetlands. Minor shifts were found, however, in species dominance toward shallower water vegetation in Wetland No. 117. This minor change in vegetation does not appear to have affected the general functions or habitat value of the wetland. The data suggest that minor ecological deviations observed in Wetland No. 117 are possibly due to its close proximity (650 feet) to the off-stream in-ground reservoir.

Flannery et al, *Using hydrologic and ecological information to develop withdrawal schedules for instream impoundments and off stream reservoirs in the Southwest Florida Water Management District.*

Abstract for Workshop on Reservoirs in the Charlotte Harbor Watershed

Presentation Preference: Oral presentation.

Related topics: location of existing reservoirs; reservoir management; regulatory considerations; freshwater inflow management

Title: Using hydrologic and ecological information to develop withdrawal schedules for instream impoundments and off stream reservoirs in the Southwest Florida Water Management District**.**

Authors: Sid Flannery, Mike Heyl, Xinjian Chen, and Marty Kelly
Southwest Florida Water Management District

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Abstract: The Southwest Florida Water Management District has conducted, or required by permit, extensive studies of the ecological effects of water supply withdrawals for offstream reservoirs and impoundments within its jurisdiction. Three offstream reservoirs and six instream impoundments on creeks and rivers in the watersheds of Charlotte Harbor and Tampa Bay are currently used for water supply. All the instream impoundments were constructed prior to 1967, as management strategies since that time have emphasized offstream reservoirs due to their greatly reduced impacts to riverine and estuarine systems. Hydrobiological studies have been conducted for all of these nine water supply systems to quantify the ecological effects of withdrawals on their downstream estuaries. Water supply withdrawals are added back into the flow records for each creek or river to model salinity and a variety of hydrobiological variables under baseline conditions. The effects of various rates of withdrawal are then simulated to develop acceptable withdrawal schedules and limits. The District has established, or is in the process of establishing, minimum flow rules for all streams in the region that have offstream reservoirs or impoundments that are used for water supply.

The status of water supply regulations and completed and ongoing minimum flow studies on these creeks and rivers will be summarized, along with pertinent findings from District research on ecological relationships of freshwater flow with downstream natural systems. The District has applied the percent-of-flow approach to regulate diversions from unimpounded rivers such as the Peace, Alafia, and Little Manatee, by which withdrawals are regulated as a percentage of baseline flow. The percent-of-flow approach is also being used to establish minimum flows for the low-head impoundment on Shell Creek, and withdrawals from impounded Myakkahatchee Creek are similarly scaled to the rate of flow.

Garlanger et al, ***Design and Construction of Earthen Reservoirs in Florida (1967-2007)***

Topic: Design of reservoir embankments

Oral or Poster Presentation Preference: Oral Presentation

Title of Presentation: Design and Construction of Earthen Reservoirs in Florida (1967-2007)

Authors' Names & Affiliations: John E. Garlanger & Thomas J. Leto

Primary Author's Contact Information: jgarlanger@ardaman.com

Presenter's Name: John Garlanger

Abstract: The Florida Phosphate Industry has been constructing earthen reservoirs for water storage and clay settling/disposal for more than 70 years. During the first 35 years of operation, the perimeter dams for the clay settling areas were simply overburden spoil (primarily silty sand) cast up in windrows and shaped to provide a crest road. The spoil windrow was excavated down to natural ground at one or two locations to install an outlet pipe for the decant structure(s). Little or no engineering was performed. Between 1936 and 1969, there were 32 reservoir failures. The first rule regulating the design and construction of earthen dams used in phosphate mining and processing operations was adopted by the state of Florida in 1969 after a reservoir failure near Brandon, Florida turned the Alafia River ■brownish-white 3.2 kilometers into the Gulf of Mexico•. The rule was subsequently modified in 1972 after a reservoir failure occurred near Fort Meade and again in 1999 after a reservoir failure occurred near Hopewell. All of the reservoirs constructed after 1969 were engineered.

The authors♠ firm has investigated, designed, monitored construction, and inspected more than 120 earthen reservoirs constructed in Florida after 1967. The paper describes the advances that have been made during the past 40 years in the investigation, analysis, design, construction and inspection of the embankment dams surrounding these reservoirs. The lessons learned in the phosphate industry have and should be applied to other earthen reservoirs constructed in Florida and elsewhere.

Hachenburg, *When a Pile of Dirt is So Much More – Dam Safety Design Criteria Memoranda*

Workshop Topic the Presentation Helps Clarify: "How have we defined "reservoirs" for this workshop, including design and management."

Presentation Preference: Oral

Title of Presentation: When a Pile of Dirt is So Much More – Dam Safety Design Criteria Memoranda

Authors' Full Names and Affiliations: Becky Hachenburg, PE – MWH

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Presenter's Name: Becky Hachenburg

Abstract: Accomplishing the goals of the various impoundments identified in the Comprehensive Everglades Restoration Plan, regardless of size and water depth, requires a balance between sound engineering, dam safety, and cost optimization. An attribute that greatly affects this balance is the potential impact of heavy rains and cyclonic activity and how these are addressed by the project's design criteria for hazard potential classification, wind setup, wave run-up, precipitation storage, and allowable over wash rates. For large above-ground storage reservoirs, every foot in height of embankment adds as much as $8 million to the specific project's cost. Although slight variations in design wind speeds, maximum precipitation, allowable over wash rates, and the combined affect of multiple variables may not seem significant, their impact often times can impact the project cost by millions of dollars. With no definitive technical guidance available for the State of Florida, MWH guided the South Florida Water Management District (SFWMD), US Army Corps of Engineers (USACE), and the Florida Department of Environmental Protection (FDEP) to jointly prepare a series of Design Criteria Memoranda (DCMs) to provide review of published technical guidance, including USACE engineering manuals, and interpretation of how these documents should be used with design development for multiple water storage reservoir characteristics. The DCMs were prepared to establish consistent guidance criteria across the different projects to facilitate owner review of design documents and designer preparation, to support the equal sharing of costs between the federal government and the state of Florida, and to facilitate review of designs by FDEP for construction permit issuance.

Criteria were developed from Florida Statute 373, as well as Public Law 104-303, Section 215 of the National Dam Safety Program Act; federal agency guidelines (the US Army Corps of Engineers, the US Bureau of Reclamation, and the Federal Emergency Management Agency); and other recognized State Dam Safety Programs.

The MWH team served as the primary authors for criteria that focused on the critical areas of:

1. Hazard potential classification
2. Wind and precipitation design criteria for freeboard
3. Spillway capacity and reservoir drawdown criteria
4. Minimum dimensions of dams and embankments
5. Liquifaction analysis
6. Embankment instrumentation
7. Dam safety program

These DCMs have become the industry standard in Florida for reservoir/dam design and are being utilized by multiple Water Management Districts. This presentation will serve to provide an overview of the seven DCMs listed above and how this guidance should be stepped through when applying to water storage bodies in areas prone for cyclonic activity.

Forest, *Ecoreservoirs Program – EAAA-1 and C-43 CERP Alternatives*

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Abstract: **ECORESERVOIR PROGRAM - EAA A-1 and C-43 CERP Alternatives**

The recently developed Ecoreservoir Program is a "public betterment" of the currently outdated, financially and ecologically unsustainable CERP concrete reservoir design.

The 2008 application of the USACE, FDEP, SFWMD best practices, with other innovations relative to riparian greenways and communities, formed the innovative Ecoreservoir Program. Substantial construction and O&M savings, community, commerce, ecological, water storage and quality benefits, for the estuaries per CERP, and ecotourism are now achievable in affordable increments. EcoReservoirs correspond with the CERP, WRDA, GAO and Northern Everglades Caloosahatchee River Watershed Protection Plan per Florida Statute being addressed by the 2009 Legislature.

C-43 West Reservoir CERP

Current Reservoir: 6 X 3 mile rectangular reservoir; 21 mile 38 ft. tall breachable levee; 18 mile canal; 200+ concrete acres; escalating cost from 355 million (2007) to 700 million range (2008); no water quality; large pump stations, high O&M, energy and capital costs.
EcoReservoir Lakes Betterment: Providing the same water storage and cfs plus water quality; including "Lake LaBelle" (C-43 Reservoir hybrid) and historic Lake Hicpochee /Disston Island; community; commerce; *jobs; plus 11,000 acres of Panther habitat restoration.*

EAA A-1 Reservoir CERP
Betterment: River of Grass Restoration Reserve (Chain of Lakes)

Current EAA A-1 Reservoir: (On hold)
Ecoreservoir Betterment: The US Sugar acquisition provides 1,000,000 acre-feet water storage with the Ecoreservoir Chain of Lakes approach, plus water quality to genuinely restore the historic River of Grass. Cities benefit from new waterfront development revenue; jobs, ecotourism, agricultural land set-asides; 100% habitat restoration; navigation; recreation and increased Glades quality of life.
Economic Concept - Co-use Everglades Restoration funds to Invest in the region's communities with new commerce and jobs, lakefront development areas to include privately financed marinas, houses, recreation, lodging, conferencing, farms, parks and neighborhoods. Affordable phases result in quicker jobs for locals and lower construction and O&M costs for the Restoration. Provide green inland logistics integrated with the cities for commuting and enhancements. Use some US Sugar land to trade with agreeable landowners to establish a more efficient River of Grass Reserve flowway and boating channel.
Education and Recreation - A 100-Mile Chain of Lakes/EcoReservoirs for fishing, hiking, bicycling, paddling, hunting, pleasure craft, education, waterfront parks and birding; an 80-100 mile boat Channel; a restoration education and interpretation center to highlight the connection of Lake Okeechobee and the River of Grass.
Ecology and Sustainable Carbon Usage - A 100-Mile Flowway /Chain of Lakes /EcoReservoirs stores and filters water with lower energy consumption; plus 180,000 acres of new wildlife habitat; not all lakes will be hydrated year round similar to others in Florida, although lakes at each community will be hydrated year round for economic benefits.

Montgomery et al, *The Use of Off-Stream Reservoirs Combined with Percent Flow Withdrawal Schedules to Reduce Downstream Estuarine Impacts.*

Topic: The importance of off-stream storage in reservoirs for public supply relative to the timing of higher freshwater withdrawals to coincide with periods of reduced potential estuarine impacts.

Presentation Type: Oral presentation with power point slides.

Title of Presentation: The Use of Off-Stream Reservoirs Combined with Percent Flow Withdrawal Schedules to Reduce Downstream Estuarine Impacts.

Authors: Ralph Montgomery, Senior Scientist and Dave Tomasko Senior Program Manager. PBS&J Watershed Science and Assessment Division. Sam Stone, Peace River Manasota Regional Water Supply Authority.

Presenter: Ralph Montgomery. 19871 McGrath Circle, Port Charlotte, Florida. Phone 941.627.3401 Fax 941.627.0901 email rtmontgomery@pbsj.com

Abstract: Historically, larger public drinking water supplies in southwest Florida relied on groundwater well fields or the construction of typical in-stream reservoirs (Hillsborough River, Lake Manatee, Shell Creek). However, by the late 1970s the lack of suitable locations and an increasing concern relative to the environmental impacts posed by in-stream structures began to lead both utilities and regulators to seek potential alternatives. In 1976, the Southwest Florida Water Management District granted a permit to construct a surface water treatment facility on the lower Peace River with the condition that adequate off-stream wet-season raw water storage be constructed to limit withdraws during seasonally drier periods. In 1988, the Peace River Facility's water use permit was modified to include a year round low flow cutoff, combined with a ten percent diversion schedule and a maximum cap on withdrawals. These changes to the Facility's permitted freshwater withdrawal schedule were designed to allow withdrawals to track actual natural variations in flows above the permitted threshold. An integral, critical component of such a variable schedule that matches withdrawals with actual changes in river flows has been the Facility's off-stream reservoir storage. An additional 6 billion gallon off-stream reservoir is scheduled for completion in mid-2009 to meet increasing regional demands.

While the annual average hydrographs of stream flows in southwest Florida generally follow distinct patterns based on characteristically dry and wet seasonal rainfall patterns, the actual seasonal patterns and variability of flows within any given year can be extremely variable. This is clearly evident in comparisons of Peace River flows over the past 5-year (2004-2008) time interval. Within estuarine systems such as the lower Peace River/upper Charlotte Harbor, the overall relationships between such variability in freshwater inflows and the spatial and temporal dynamics of both physical habitat characteristics and the resulting structure of biological communities are complex and mediated through a number of intermediary processes.

Research by the Nature Conservancy has recently addressed the necessity of balancing the needs for surface water withdrawals for public supply with maintaining the magnitude and timing of ecological flows to protect estuarine biological communities. Key components of their recommendations center on maintaining periods of both maximum as well as minimum base flows, as well as protecting flows during periods identified as critical to specific estuarine biological resources.

Since 1976 the permit for the Peace River Water Treatment Facility has required the implementation of a hydrobiological monitoring program (HBMP) to both assess the overall "health of the harbor" by tracking the long-term changes in physical and biological characteristics, and evaluate the magnitude of potential changes due to Facility withdrawals relative to natural seasonal and longer term variations in freshwater inflows. The results of over 30-years of HBMP monitoring have clearly identified critical periods relative to estuarine production when the estuary has greater sensitivity to withdrawals, and conversely extended intervals when the potential impacts of withdrawals are greatly reduced. The use of off-stream reservoirs provides the Facility with the opportunity to harvest water from the river at the appropriate time and the appropriate quantities to reduce potential estuarine impacts.

Orendorff et al, *The Role of Agricultural Reservoirs in Watershed Management*

Workshop Topic: What are the Direct and Secondary Benefits and Impacts of Reservoirs; or
What are Alternative Management Options and Reservoir Designs

Preference: Oral or Poster

Title: The Role of Agricultural Reservoirs in Watershed Management

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Presenter: Bill Orendorff

Abstract:
The Southwest Florida Water Management District (District) takes a unique approach to watershed management and restoration through its "Facilitating Agricultural Resource Management Systems", or FARMS Program. The FARMS Program, developed by the District and Florida Department of Agriculture and Consumer Services, is a public/private agricultural Best Management Practices (BMPs) cost-share reimbursement program. FARMS is intended to expedite the implementation of production-scale agricultural BMPs that provide water resource benefits. Resource benefits of the FARMS Program include; reduced Floridian aquifer withdrawals, water quality improvements, and/or the conservation, restoration, and augmentation of the area's water resources and ecology. The program has proved to be a win-win partnership for both the water resources of the District as well as agricultural participants, particularly in the Shell and Prairie Creeks (SPC) watersheds.
Shell and Prairie Creeks flow through Charlotte and DeSoto counties in the southern region of the Peace River basin and supply water to the City of Punta Gorda's in-stream drinking water reservoir. The SPC watersheds comprise a land area of 370 square miles with a land use that is predominantly agricultural. Both creeks are considered "verified impaired" under the Florida Department of Environmental Protection's total Maximum Daily Load (TMDL) Impaired Waters Rule due to elevated concentrations of chloride specific conductance, and total dissolved solids (TDS). In response to TMDL verified impairment and water quality impacts to a public supply system, a Reasonable Assurance Plan has been developed which documents management actions that will restore water bodies in the SPC watersheds to unimpaired conditions. One of the important resource management actions is the FARMS Program.

In situations where pumping highly mineralized groundwater is detrimental to crop production and water resources it is often necessary to utilize an alternative irrigation source. An effective BMP implemented by the FARMS Program that has proven to achieve both water quality improvements and groundwater conservation is the development of surface water and/or tailwater recovery ponds. The use of these ponds for irrigation is effective in reducing or "offsetting" the amount of mineralized ground water that is withdrawn from the Upper Floridian aquifer and can serve as the primary means for improving water quality of the downstream watershed. To date, 18 of these agricultural reservoirs are either under construction or in operation as part of a FARMS project in the SPC watersheds. These reservoirs vary in surface area from 1 to 100 acres and, in total, are used to irrigate 8,300 acres of citrus, blueberries and row crops, and are projected to offset 4.975 MGD of groundwater pumping for irrigation.

Roberts et al, *Water Storage Considerations: a Case Study of an Alternative Design Plan*

Workshop Topic: Need, Purpose, Design and Management Options

Title of Presentation: Water storage considerations: a case study of an alternative design plan.

Authors' Names & Affiliations: Church Roberts, Jaime Greenawalt Boswell, and Lonnie Howard – Johnson Engineering, Inc.

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Abstract: Water storage, supply, and quality are some of the most critical issues facing Southwest Florida, as well as countless other places throughout the world. The water supply needs have been rising rapidly with human population growth, agriculture and industrial demands. Additionally, implementation of minimum flows and levels regulations requires water supply to meet environmental demands. Land use changes within the Charlotte Harbor National Estuary Program area have altered the historic natural water storage throughout the watersheds, and reduced the natural capacity for nutrient reduction. The majority of reservoirs are designed to provide a water storage facility to meet current and projected water supply and storage needs for municipal and industrial demands. Reservoir design considerations may also include flood control, restoring and maintaining water quality, conserving fish and wildlife, protecting threatened and endangered species, and providing recreation. Other considerations include construction and operation cost and materials.

The majority of reservoirs are designed for in-stream storage, although in Florida off-stream reservoirs are currently favored to reduce in-stream water quality and habitat impacts. An alternative option is the restoration of natural water storage within the watersheds. Although in most cases current landuse will preclude this option, there are areas within the Charlotte Harbor National Estuary Program which could be used for storage. Johnson Engineering designed an alternative water storage facility, Tippen Bay, which we will present as a case study on design considerations.

The Tippen Bay facility was designed and is proposed to store water in the Prairie Creek sub-basin of the Peace River watershed. The facility would create a 6100 acre footprint on 20,000 acres of land in southeast DeSoto County and northeast Charlotte County, currently under private ownership. The design of this facility was based on the historic water storage capacity, and hydroperiod analyses of 30 years of water level and flow data. Modeling using this data indicates the ability to mimic natural scenarios through the use of water control structures. The restoration capacity of this facility would result in a self-mitigating project, with no net wetland impacts, while providing significant woodstork foraging base. The system is modeled to reduce nutrient loading, thereby providing improved water quality downstream. A major benefit of this alternative approach is the use of a gravity fed system which is not reliant on energy consumption. With the rapidly developing demand for reduction in energy consumption and greenhouse gas emissions, energy consumption is likely to play a bigger role in project evaluation in the near future.

Scheda et al, *C-43 West Basin Storage Reservoir: An Acceler8 Project's Development Process, Potential Environmental Benefits, and Calculated Impacts*

Workshop Topic: Information Exchange on Potential Benefits and Impacts of Reservoirs

Oral or Poster Presentation: Prefer Oral

Title of Presentation: C-43 West Basin Storage Reservoir: An Acceler8 Project's Development Process, Potential Environmental Benefits, and Calculated Impacts

Author's Names/Affiliations: Sandy Scheda, Scheda Ecological Associates, Inc., Dave Grounds, PE, Stanley Consultants, Inc.

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Presenter's Name: Sandy Scheda and Dave Grounds

Abstract: The C-43 West Basin Storage Reservoir has been planned, designed, and permitted, and is ready for construction, and this remarkable achievement is the summation of years of project conceptualization, modeling, planning and engineering completed by a large group of professionals with varying affiliations. The primary purpose of the project is to improve the timing and quality of fresh water flows to the Caloosahatchee River Estuary, resulting in improved water deliveries, provision of dry season flows, and restoration of downstream salinity levels that will support key estuarine species.

Initial CERP planning and modeling efforts identified a starting project concept that would meet the acceptable salinity range for the downstream estuarine ecosystem, which was equated to require mean freshwater inflows of 300 cfs to 2800 cfs passing the most downstream structure, S-79 (Franklin Lock). It was estimated that a reservoir of approximately 160,000 acre-feet would be needed to provide a more natural and consistent flow over S-79 to the estuary. Additional modeling showed that approximately 71,000 acres of the estuary would be beneficially affected in the Caloosahatchee River, San Carlos Bay, and Pine Island Sound.

The project was fully developed using a tiered approach, with evaluation and impact analysis completed for each step of the process. The various tiers included development and analysis of:

- Alternate plan component types, including reservoirs, restoration of natural storage areas, stormwater treatment areas, aquifer storage and recovery, backpumping with stormwater treatment, oxbow restoration, operational alternatives, and best management practices;
- Alternative project sites within the east and west basin areas using 'Gate' criteria;
- Alternative project sites using 'General' criteria; and
- Alternative project designs.

For each tiered analysis above, evaluation of social, natural, physical, and economic impacts was used to reduce the number of alternatives that would proceed to the next stage of more detailed analysis.

This presentation will focus on two project development stages: site selection and engineering design alternatives. For each stage, the selection of evaluation criteria and evaluation of impacts was completed by the team. For site selection, thirty-one (31) potential sites and site combinations were evaluated and scored during the site screening process using thirty (30) different criteria. The Berry Groves site was selected for design. For engineering design, alternatives were developed for the site layout, pump configuration, and dam materials design. Following evaluation, a two-cell layout with one pump station was recommended. A test cell pilot project was designed, permitted, constructed and operated to evaluate the different dam designs.

Schreuder, Peter, ***Capture & Storage of Surface Water in the Peace River Basin – Above -round vs. Underground Storage***

Topic: A historical review of plans to store surface water in the Peace River drainage basin, discussion of in-stream versus off-stream reservoirs and the description of the potential for underground storage of surface water.

Oral or Poster Presentation Preference: Oral Presentation

Title of Presentation: Capture & Storage of Surface Water in the Peace River Basin – Above -round vs. Underground Storage

Authors' Names & Affiliations: Peter J. Schreuder, Schreuder, Inc. Tampa, FL

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Presenter's Name: Peter J. Schreuder

Abstract: 1-2 paragraphs, <500 words

In 1976 the U.S. Army Corps of Engineers (USACE) together with the Southwest Florida Water Management District (SWFWMD) funded studies to determine the projected water demands for the years 1985 and 2035 and to create plans to manage the water resources in the SWFWMD area to meet these demands. As project manager for the USACE Mr. Schreuder evaluated the feasibility of constructing 23 potential surface water reservoir sites in the Peace River and the Myakka River Basins.

In 1994, Schreuder, Inc. was asked by the Florida Institute of Phosphate Research (FIPR), an independent State agency, to assess the possibility of using old mine pits created by the phosphate mining process prior to mandatory reclamation as surface-water reservoirs. After a preliminary one-year study it was determined that the use of mine pits as in-ground off-stream surface water reservoirs was not practical and not environmentally beneficial. This preliminary investigation led to fourteen subsequent years of research, which culminated in the development of the Aquifer Recharge & Recovery Program (ARRP) concept.

The ARRP concept uses wetlands to improve water quality and sand filtration to remove suspended particles and microorganisms. Eight years of research under actual field conditions have shown that effluent and even industrial wastewater can be naturally treated to meet primary drinking water standards. The naturally treated water can then be recharged into the Floridan aquifer for storage and can be retrieved at a different time and at a different location. The ARRP concept can be used to increase the availability of future ground water supplies to meet future demands, while at the same time providing a net environmental benefit to the Floridan aquifer even in the most restricted Water Use Caution Areas. This is made possible by the SWFWMD, which will allow ninety percent (90%) of the cumulatively recharged volume of water to be withdrawn from the Floridan Aquifer at a later date and different location. The ARRP concept does require the use of a reservoir to store surface water run-off during high flow events. From these reservoirs surface water can be discharged at a predetermined rate to the wetland/filtration system that optimizes the natural water treatment capacity of tailing sands and wetalnds. A comparison of traditional in-stream storage reservoirs and off-stream reservoirs demonstrates the advantages of the ARRP concept.

Shea*, Ecological Monitoring at the C.W. Bill Young Regional Reservoir*

Topic: Effects on rivers and Estuaries

Author & Presenter: Christopher Shea, Tampa Bay Water, 2575 Enterprise Road, Clearwater, Florida 33763-1102, (727) 796-2355, cshea@tampabaywater.org

Title: Ecological Monitoring at the C.W. Bill Young Regional Reservoir

Abstract: The C.W. Bill Young Regional Reservoir, is an above-ground, off-line reservoir that stores water skimmed from the Alafia River and Tampa Bypass Canal during high flows. The reservoir, completed in the spring of 2005, is located in Hillsborough County (approximately 25 miles southeast of Tampa) on an approximately 5,000 acre parcel owned by the Southwest Florida Water Management District. When full, the reservoir has a surface area of approximately 900 acres and holds up to 15 billion gallons of water. The reservoir was designed to reduce reliance on groundwater supplies during dry times.

Seepage from storage of water above the adjacent natural grade is limited by the reservoir's design, which includes an impermeable geomembrane within the interior embankment, a seepage collection system within the berm and reliance on the natural confining units within the underlying aquifer to limit leakance. (A soil-bentonite cutoff wall beneath the perimeter berm ties into the confining units.) Some seepage into the adjacent surficial aquifer system is expected, however, with the normal operation of the facility. The Environmental Resource Permit (ERP) for the reservoir, issued in 2002, contained a Monitoring and Management Plan (MMP) that required monitoring of nearby wetlands, creeks and upland plant communities for any possible deleterious effects of seepage.

Monitoring of water levels in creeks, wetlands and aquifer monitoring wells (surficial, intermediate and Floridian aquifers are present on-site) was initiated prior to reservoir construction. Vegetation in the surrounding creek floodplains, wetlands and uplands is monitored at 12 transects, and by remote sensing techniques. The data are analyzed and annual and semi-annual reports submitted to local, state and federal agencies.

In general, water levels in the wells monitored follow normal seasonal patterns. Based on LOWESS (local weighted scatterplot smoothing) analysis, some surficial and intermediate aquifer monitoring wells within 1,000 feet of the reservoir embankment, however, have shown dampened seasonal fluctuation, and potential water level increases, due to reservoir operations. Trend and temporal t-test (comparing pre-fill and post-fill periods) analyses of water level data from transects in adjacent creeks and wetlands, however, do not indicate changes in hydrology due to reservoir seepage. A water budget equation designed to solve for seepage indicates a seepage rate (for the operational period May 2005 – April 2008) of approximately 1.5 MGD for the reservoir, approximately half the rate predicted during project design.

Stone et al, *Environmental and Water Supply Benefits of an Off-stream Reservoir System at the Peace River Regional Water Supply Facility.*

Topic: The operation and management for off-stream reservoirs, increased system reliability and the environmental benefits provided by these reservoirs for a public water supply system located in southwest Florida.

Presentation Type: Oral presentation with power point slides.

Title of Presentation: Environmental and Water Supply Benefits of an Off-stream Reservoir System at the Peace River Regional Water Supply Facility.

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Abstract:

The Peace River Regional Water Supply Facility (PRF) supplies potable water to over 250,000 people over a four county region. The PRF uses surface water harvested from the Peace River as its source of supply. Withdrawals from the River are made on a flow-based diversion schedule, allowing harvest of only a small percentage of flow to meet public water needs while reserving the majority of flow to serve the needs of the estuary. During a typical annual dry season, and periodically for extended drought periods, the portion of flow available for harvest from the river is insufficient to meet public water demand. Under these circumstances the PRF is able to reliably meet this public demand through the use of off-stream reservoirs. The off-stream reservoir is filled by the harvesting of extra water, above daily public demand during the wet season and storing this river water in the reservoir for use during dry periods.

The Peace River is also subject to changes in water quality that can affect public water supply withdrawals. These changes in quality can be due to releases of poor water quality from up-stream lakes, storm water discharges or poor quality ground water discharges. In addition to water quality changes upstream, the PRF withdrawals can also be affected by conditions downstream. At lower flow conditions in the River saline waters from Charlotte Harbor can migrate upstream. The extent of saline water migration upstream can be exacerbated by wind and tide conditions When such changes in water quality occur, the PRF is able to avoid these temporary poor water quality events by not pumping from the river and relying on the stored water in the off-stream reservoir to meet the public's need for water.

The Peace River flow into Charlotte Harbor varies greatly during the year. This natural variation in flow and the timing of that flow brings much needed nutrients to the estuary and results in the productivity that sustains Charlotte Harbor. Data from the Peace River Hydrobiological Monitoring Program (HBMP) shows that nutrients delivered to the estuary during low flows at the beginning of the wet season is the most productive and critical period for the estuary and that nutrients delivered later in the wet season is of less benefit due to highly colored water. The combination of the PRF permitted diversion schedule and the off-stream reservoir allows the facility to pump more water during high flows and pump little or no water during the more sensitive periods of low flow at the beginning of the wet season. This helps to protect and sustain the productivity of Charlotte Harbor.

The long record of operation at the PRF and data collected from the Authority's Hydrobiological Monitoring Program show that off-stream reservoirs at the PRF provide an environmental water reservation for Charlotte Harbor, protecting the downstream estuary while providing a high-quality, reliable water supply for the four county region.

Tomasko et al*, Linking Ecological Restoration with Water Supply Development using Off-stream Reservoirs in Southwest Florida.*

Topic: Potential ecological restoration opportunities linked to water supply development using off stream reservoirs in Southwest Florida.

Presentation Type: Oral presentation with power point slides.

Title of Presentation: Linking Ecological Restoration with Water Supply Development using Off-stream Reservoirs in Southwest Florida.

Authors and Presenter Contact Information: Dave Tomasko, Senior Program Manager, Pam Latham, Senior Scientist and Ralph Montgomery, Senior Scientist, PBS&J Watershed Science and Assessment Division, and Pete Putman, Senior Division Manager, Water-West Florida. Mike Coates, Water Resources Division Manager, Peace River Manasota Regional Water Supply Authority.

Presenter: Dave Tomasko. 5300 W. Cypress Street, Tampa, Florida, 33607. Phone 813.281.8346 Fax 813.287.1745. Email: DATomasko@pbsj.com

Abstract:

The Peace River Manasota Regional Water Supply in cooperation with the Southwest Florida Water Management District are currently in the process of evaluating alternatives with regard to locating new off-stream reservoirs in the Upper Myakka, Cow Pen Slough and Shell Creek watershed to provide both hydrologic restoration and additional new regional water supplies.

The Upper Myakka River and Flatford Swamp, were identified more than 10 years ago as having impaired ecosystem functions, due in large part to an excess of fresh water. In Flatford Swamp, approximately 3,000 acres of dead and dying trees in this portion of the Upper Myakka River watershed are impacted by higher water levels and extended hydroperiods. These impacts are thought to be due to an increased amount of inflows associated with land use changes in the surrounding watershed.

Dona Bay's impacts are associated with excessive freshwater inflows from the expanded size of the Cow Pen Slough watershed, a finding first made more than 30 years ago. The contributing watershed increased in size due to historical large-scale drainage modifications for agricultural purposes.

In Shell Creek, a tributary to the lower Peace River, dry season flows have increased over historical levels, a phenomenon reported by scientists with the Southwest Florida Water Management District more than a decade ago. In contrast to Dona Bay and the Flatford Swamp, there does not appear to be a well-documented ecological problem in Shell Creek associated with excessive quantities of freshwater inflow. However, the augmentation of dry season flows by high conductivity water from upstream discharges has adversely affected the City of Punta Gorda's downstream drinking water quality behind the Shell Creek dam.

Despite findings, now 10 to 30 years old, that these systems either have an "excess" amount of flow (i.e., Flatford Swamp and Dona Bay) or that there appears to be a significant concern about declines in water quality (i.e., Shell Creek) the stresses to these systems continue.

Creating a nexus between the need for ecological restoration and new water supply development via the use of off-stream reservoirs resulting in hydrologic restoration was the focus of a recently completed study co-funded by the Peace River Manasota Regional Water Supply and the Southwest Florida Water Management District. Basic conclusions from this effort with regard to hydrology and water quality will be discussed.

Wantland, et al, *Site Evaluation Study for Potential Raw-Water Off-Line Regional Reservoir Storage Facility*

Title of Presentation: Site Evaluation Study For Potential Raw-Water Off-Line Regional Reservoir Storage Facility

Related Topics: Reservoir siting, design, management, locations and impacts.

Type of Presentation: Oral presentation with PowerPoint.

Authors: Gary M. Wantland, MWH Americas, Inc.; William Weber, MWH Americas, Inc., Jimena Pinzon, MWH Americas, Inc., Mike Coates, Peace River Manasota Water Supply Authority.

Presenter: Gary Wantland, P.E.; MWH Americas, Inc.; 1000 North Ashley Drive Suite 1000, Tampa, Florida; email Gary.Wantland@mwhglobal.com

Abstract: Regional water supply planning efforts in the southwest portions of Florida must consider long-term population growth combined with limitations on ground water resources in meeting the demand for future drinking water supply in an environmentally-sound and reliable way. Recent severe droughts are further stressing water sources. The Southwest Florida Water Management District has encouraged water suppliers (city / county governments and regional wholesale water suppliers) to develop alternative water supplies such as high flow surface water harvesting and off-line raw water storage.

The Peace River Manasota Regional Water Supply Authority (Authority) is a regional water supply authority created in 1982 to provide water to Charlotte County, DeSoto County, Sarasota County, and the City of North Port (customers). The Authority will also provide water to Manatee County starting in 2017. The Authority is continuing to evaluate potential available water supplies that will allow them to meet existing and projected future water demands of their customers.

The Authority recently undertook a feasibility study to evaluate potential alternative surface water supplies based on an examination of existing available water resources within the Upper Myakka (UM) and Shell-Prairie Creek (SPC) watersheds. The challenges associated with the development of these water supplies includes “flashy” stream-flow characteristics; wide, shallow water-bodies with relatively small volumetric stream flows; long distances from existing and near-term population centers; and potential water quality concerns. One component of that evaluation was the identification of potential locations for an off-line raw water reservoir.

The work described in this presentation consists of a multi-phase, multi-step evaluation process used to identify, characterize, evaluate and rank potential off-line reservoir sites. Identification and evaluation of potential sites was completed using a screening process in which the search area was progressively narrowed based on a review of physical, environmental, land use, and land acquisition factors. The process used a series of coarse and fine level screenings to focus potential land acquisition activities on locations that were judged to be compatible with construction and operation of a reservoir. Key features of this analysis include:

- Development of geographic information system (GIS) maps to characterize selected features of the selected watersheds under consideration;
- Elimination of unsuitable areas within each watershed using an exclusionary process;
- Characterization and evaluation of each site using a pre-selected set of evaluation criteria;
- Ranking of sites using a weighted scoring methodology; and
- Development of relative site construction costs.

Site scores were established by the application of a judgment-based selection process using a relative / comparative scoring approach. Evaluation criteria used in the assessment of potential site suitability included present land use, long range planning, physical and geologic site conditions, environmental considerations, safety, engineering features and construction aspects as well as costs. Potential construction costs were developed consistent with the level of detail available for each site. In addition, cost estimates were developed for land acquisition, reservoir construction, environmental restoration, and mitigation. Selection of sites for further evaluation was based on a comparison/evaluation of the individual site rankings and relative cost factors.

At the conclusion of this effort potentials sites in each watershed were ranked in terms of preference for further investigation and possible acquisition for a potential new off-line reservoir location.