Inlet Management Study of the John’s Pass – Blind Pass Dual-Inlet System, Pinellas County, Florida

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American Shore & Beach Preservation Association
2015 National Coastal Conference, New Orleans, Louisiana
October 2015
Study Objectives

A. This inlet management study - initiated 5/2014 - is being conducted by the University of South Florida Coastal Research Lab under contract with the Florida DEP (contract no.# BS032).

B. Provide an updated sediment budget for Blind Pass and John’s Pass.

C. Identify and quantify system-wide sediment pathways in order to update inlet management plans pursuant to Section 161.142, Florida Statutes.

D. Provide an evaluation of inlet management implementation strategies.
1. Introduction/Background
   a) Study area
   b) Regional hydrodynamic conditions
   c) Sediment characteristics

2. Sediment Budget and Sediment Pathways
   a) Sediment budget
   b) Sediment pathways

3. Concluding remarks
Study Area

Legend

- SMS Model Domain

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerlocmodels, IGN, and the GIS User Community
John’s Pass
Mixed Energy Tidal Inlet

Channel Width – 185 m (607 ft)
Maximum channel depth 12 m (39 ft)
Blind Pass
Wave Dominated Tidal Inlet

Maximum channel depth 9 m (29.5 ft)

North Jetty
R143
Channel Width 160 m (525 ft)
Ebb Delta
South Jetty
Flood Delta

Upham Beach T-groins
Installed 2004-2006

Pre-dredging 2010 image
Spring Tide Range: 1.1 m (microtidal) Neap Tide Range ~0.4m
Offshore-inshore flooding phase lag , 45 min (BP); 70 min (JP)
Offshore-inshore ebbing phase lag , 20 min (BP); 50 min (JP)
Domain Boundary Measured Wave
8/8/2014 – 10/7/2014

Significant Wave Height

Time
7/30/14 0:00  8/9/14 0:00  8/19/14 0:00  8/29/14 0:00  9/8/14 0:00  9/18/14 0:00  9/28/14 0:00  10/8/14 0:00

Hs (m)
0 0.2 0.4 0.6 0.8 1 1.2

T (s)
0 0.2 0.4 0.6 0.8 1 1.2

Hs (m)
0 0.2 0.4 0.6 0.8 1 1.2

Wave

Wind Speed (kn)
- 20 14 - 20
10 - 15
9 - 10
8 - 9
7 - 8
6 - 7
5 - 6
4 - 5
3 - 4
2 - 3
1 - 2
0 - 1

NORTH
WEST
SOUTH
EAST
Domain Wave Conditions

WW Hs 10/2010 - 7/2014

WW Hs Direction 10/2010 - 7/2014
John's Pass ADCP 8/7/14 - 8/13/14

FLOOD

EBB

Time

8/7/14 0:00 8/8/14 0:00 8/9/14 0:00 8/10/14 0:00 8/11/14 0:00 8/12/14 0:00 8/13/14 0:00 8/14/14 0:00

Current Velocity (m/s)

Water Level (m msl)

depth averaged velocity (m/s) Water level
Blind Pass Current Measurement – Deployed
8/14/14 – 9/11/14

Blind Pass ADCP 9/1/14 - 9/12/14

FLOOD

EBB

Time

depth averaged velocity (m/s) Water Level

Water Level (m msl)
John’s Pass - Blind Pass Sediment Data

Distribution of sediment mean grain size (in millimeters)

**Overall mean grain-size (D\textsubscript{50}) 17 mm**

\[
\begin{align*}
D\textsubscript{10} & = 0.08 \\
D\textsubscript{50} & = 0.17 \\
D\textsubscript{90} & = 10.0
\end{align*}
\]
Section 2

- Ebb Shoal Volumes
- Sediment Budget
- Sediment Pathways
Ebb Shoal Volume Changes

John’s Pass 6/2010

Time series bathymetric surveys:
- 6/2010 pre-dredging (single beam)
- 10/2010 post-dredging (single beam)
- 1/2011 (single beam)
- 10/2011 (single beam)
- 7/2012 (single beam)
- 7/2014 (multi-beam)

Blind Pass 6/2010

Beach Survey Data:
- USFCRL R-monument monthly to bi-monthly surveys of SK, TI, LK 2006-present.
- USFCRL annual bathymetric offshore survey extensions of R-monument surveys.
The John’s Pass ebb shoal, July 2014, overlaying synthetic bathymetry, with 20X vertical exaggeration. Different color scales are used for the two bathymetry images to more clearly illustrate the ebb shoal.

Area of ebb shoal is 2,043,000 m²
Volume = 3,286,000 m³ (4,298,000 yd³)
The Blind Pass ebb shoal, July 2014, overlaying synthetic bathymetry, with 20X vertical exaggeration. Different color scales are used for the two bathymetry images to more clearly illustrate the ebb shoal.

**Area of the ebb shoal is 899,000 m²**

**Volume 515,000 m³ (673,000 yd³)**
Ebb Shoal Volume Changes


1988 dredge pit ~405,000 m³ (529,200 c.y.)
(CTC, 1993)
base of dredge pit -5.1 m NAVD

Infilling rate 6/2010 -7/2014 gained 9,000 m³
Annualized 300 m³/yr

2010 dredge pits
Terminal lobe –west pit -4.25 m NAVD; 153,000 m³ (200,000 c.y.)
Channel margin linear bar -4.5 m NAVD; 130,000 m³ (170,000 c.y.)
TOTAL- 280,000 m³ (366,000 c.y.)
Ebb Shoal Volume Changes

Survey Data: 6/28-29/2010
single beam survey

Survey Data: 10/22-23/2010
single beam survey

2010 dredge pit (-4.7 m NAVD)
120,000 m³ (157,000 c.y.)
Section 2

- Ebb Shoal Volumes
- Sediment Budget
- Sediment Pathways
SK-TI-LK Longshore Transport Vectors

John's Pass

Blind Pass
Sediment Budget – N. End (SK)

Regional Sediment Budget
R60 – R165

Sand Key Volume Change: 2012-2014

Divergence in sediment transport direction R160-R161
Regional Sediment Budget 10/2010-6/2014

887,000 m$^3$ placed on SK
R60-R66, R71-R107 11/2012

3.7 years
Annualized
Sediment Budget 10/2010-6/2014

3.7 years

Annualized
Sediment Budget 10/2010-6/2014

3.7 years

122,000 m³ (159,000 y³)
placed in 10/2010
indicating 26% retained
Sediment Budget 10/2010-6/2014

Legend
- CELL LOSS
- CELL GAIN

(To Blind Pass Ebb Shoal)

(95,000 from Blind Pass Ebb Shoal)

LK 4

R 148

117,000

78,000 GAIN

(80,000 to Pass-a-Grille)

39,000

10,000

11,000 LOSS

31,000

21,000 LOSS

0 0.5 1 2 Km

Legend
- CELL LOSS
- CELL GAIN

(To Blind Pass Ebb Shoal)

(25,000 from Blind Pass Ebb Shoal)

LK 4

R 148

3.7 years

Annualized
Section 2

- Ebb Shoal Volumes
- Sediment Budget
- Sediment Pathways
Sediment Pathways John’s Pass

Legend
- Designated Channel
- 2010 West Dredge Pit
- 2010 Channel Dredge Pit
- Channel Margin Linear Bar
- Attachment Bar
- Swash Bar Complex
- Inner Channel

3.7 years

Annualized
Sediment Pathways Blind Pass

Legend
- Channel (bathymetric, not Federally maintained)
  - 2010 Dredge Pit
  - Channel Margin Linear Bar
  - Swash Bar Complex

3.7 years

Annualized
Conclusions

- Infilling of the JP 2010 terminal lobe dredge pit (below -5 m NAVD) will take ~ 15 to fill.
- Infilling of the John’s Pass channel dredge pit will take ~ 8 years.
- Infilling of the Blind Pass inner shoal dredge pit will take ~ 4 years.
- Dredging of the Blind Pass inner shoal inhibits development of the ebb delta and sand bypassing to the downdrift beaches.
Conclusions

➢ The majority of the sediment placed on and eroded from the beaches immediately downdrift of the inlets migrates onto the downdrift bypass bars of the adjacent ebb deltas (ie. Sunshine beach on TI and Upham on LK).

➢ 30% or less of the sediment placed on Upham beach in 2010 was transported to the south end of Long Key and Pass-a-Grille inlet.
Acknowledgments

- Florida Department of Environmental Protection (Bob Brantly, Ralph Clark, Guy Weeks)
- Pinellas County (Andy Squires, John Bishop)
- Ping Wang, the co-author of this talk
- And ASBPA for providing the forum here today
The End

Questions?