# DEVELOPMENT AND APPLICATION OF A HEC-RAS MOBILE-BED SEDIMENT TRANSPORT MODEL OF THE MIDDLE RIO GRANDE

Middle Rio Grande Endangered Species Collaborative Program – 2019 Science Symposium Prepared by Jonathan AuBuchon, PE – Albuquerque District, USACE Ryan Gronewold, PE – Albuquerque District, USACE Stephen Scissons, PE – Albuquerque District, USACE Walt Kuhn, PE – Tetra Tech David Pizzi, PE – Tetra Tech

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### WHY A SEDIMENT MODEL?















## WHY A SEDIMENT MODEL?

#### **East Elevation**





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SW

W





Tt







# **COCHITI REACH**

22.5 River Miles 10 Contributing Tributaries

# ALBUQUERQUE REACH

40.5 River Miles 8 Contributing Tributaries

# **ISLETA REACH**

53.0 River Miles6 Contributing Tributaries

# SAN ACACIA REACH

56.2 River Miles11 Contributing Tributaries



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# MODES OF SEDIMENT TRANSPORT







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## RIO GRANDE AND TRIBUTARIES PRELIMINARY DATA COLLECTION AND ASSEMBLY (2012)





## *RIO GRANDE AND TRIBUTARIES TRIBUTARY SEDIMENT YIELD AND DELIVERY STUDY* (2013)



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# LIMITATIONS

No simulation of sediment plugs No simulation of width change and vegetation encroachment









**MODEL SCENARIOS** 

Scenario	Cochiti Reach	Albuquerque Reach	Isleta Reach	San Acacia Reach
Calibration	$\checkmark$	✓	✓	✓
Validation	✓	✓	$\checkmark$	✓
Baseline	✓	$\checkmark$	$\checkmark$	✓
Predictive	5	9	9	14

Value from comparative assessments

Hydrologic inputs and tributary sediment loading are the most influential, so applied boundary conditions are the key determinants of results









### **SUMMARY OF VALIDATION RESULTS**





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### **SUMMARY OF VALIDATION RESULTS**





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Scenario	Cochiti Reach	Albuquerque Reach	Isleta Reach	San Acacia Reach
Baseline	Near-equilibrium channel mass Floodplain deposition	Net channel aggradation Floodplain deposition	Net channel degradation upstream; aggradation downstream Floodplain deposition	Net channel aggradation, but downstream influenced by EBR pool levels Floodplain deposition
Selected Predictive (tributary sediment loading; reduced snowpack; EBR pool)	Tributary sediment loading drives sediment supply to Albuquerque Reach Nearly armored bed surface Supply-limited transport	Geomorphic channel response is sensitive to Rio Jemez sediment loading	Rio Puerco and Rio Salado substantially influence downstream portion of this reach	U/S extent of EBR high pool is about RM 97 (~10 mi U/S BdA)

#### **SUMMARY OF REACH RESULTS**







Water	VFS	FS	MS	CS	VCS	VFG	FG	MG
Year	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
2003	5.9	15.3	44.4	27.8	4.5	1.6	0.5	0
2004	6.5	17.0	42.4	29.7	3.7	0.6	0.1	0
2005	8.3	19.7	32.9	29.5	6.9	1.7	1.1	0.0
2006	19.1	30.0	35.1	15.8	0	0	0	0
2007	8.4	19.6	40.7	29.0	2.2	0	0	0
2008	8.9	20.7	33.7	31.1	4.9	0.5	0.1	0.0
2009	9.6	21.4	35.9	29.1	3.7	0.2	0.0	0.0
2010	9.5	21.3	34.9	30.5	3.7	0.0	0	0.0
2011	21.4	32.4	33.2	12.9	0	0	0	0
2012	16.7	27.7	37.1	18.5	0	0	0	0
2013	47.3	52.6	0	0	0	0	0	0
2014	11.2	22.0	42.0	24.8	0	0	0	0
2015	8.3	19.2	43.2	27.4	1.8	0	0	0
2016	8.3	19.5	41.8	28.0	2.5	0	0	0
2017	9.1	20.9	32.8	31.1	5.3	0.7	0.2	0.0
AVG.	13.2	24.0	35.4	24.3	2.6	0.3	0.1	0.0



Isleta Diversion Dam: sediment management and RGSM passage





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### **EXAMPLE APPLICATION OF THE MODEL**

Tiffany Fire Rehabilitation Planning: targeting of measures





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## POC: JONATHAN AUBUCHON E-MAIL: <u>Jonathan.Aubuchon@usace.army.mil</u> Phone: 505-342-3400





