

Two Decades of Restoration on the Middle Rio Grande

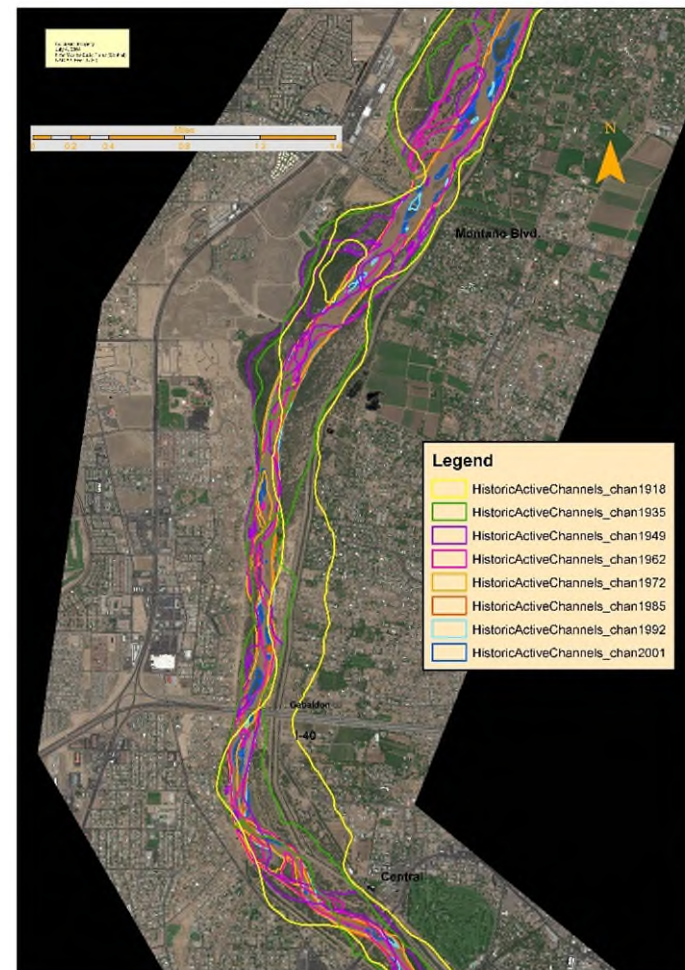
Ondrea Hummel, CERP, Ecology Discipline Lead, Senior Ecologist



Historic conditions and changes to the river and floodplain

- Anthropogenic changes (riverside drain, levees, dams, population increase):
 - Hydrology – quantity, timing, duration; compact delivery
 - Non-native vegetation
 - Geomorphology
- **1918-1989 channel changes**
 - Albuquerque Levees mid 1950's
 - Jetty Jacks – 1960's
 - Cochiti Reservoir - 1972

Middle Rio Grande - Albuquerque Reach
Channel Change, 1918-2001



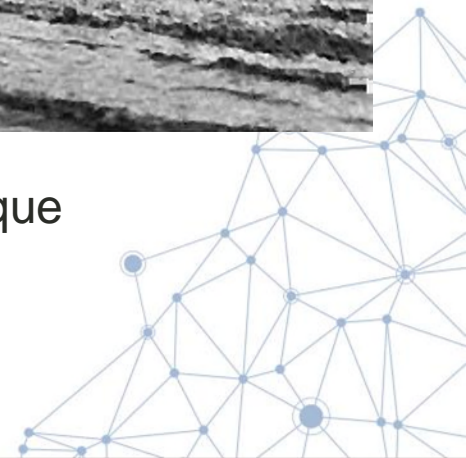
Date	Flow (cfs)
4-24-1942	25,000
6-23-1949	10,800
5-30-1958	12,700
8-10-1967	13,300
5-14-1973	8,570
5-25-2008	5,400
4-14-2009	4,940
8-17-2012	2,510
9-13-2013	4,350
6-7-2016	3,950
5-10-2017	5,660
7/15/2018	1,190
6-18-2019	5,720
6-30-2020	723
5-31-2021	2,250

Peak flows



USGS Rio Grande at Albuquerque

Cochiti Dam closed in 1972



Anthropogenic changes resulting in

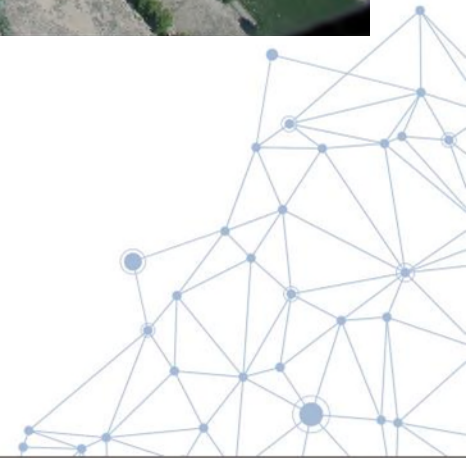
- **Water Flows**

- *Constraints on the system* (population increase, Compact requirements)
- Water Quantity, Drought
- Climate Variability

- **Disconnected floodplain**

- **Fire**

- **Non-Native Invasive Species**

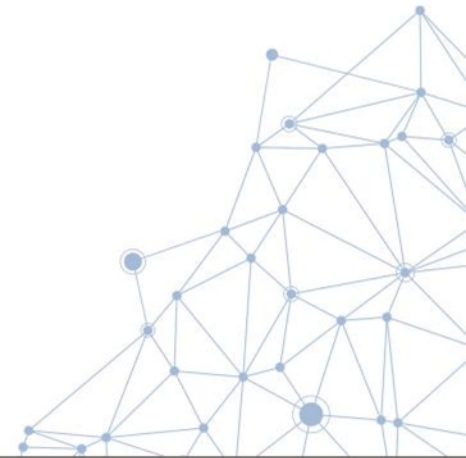


Dominance of non-native invasive species

- Salt cedar
- Russian olive
- Siberian elm
- Tree of Heaven
- Ravenna grass



RESTORATION – REHABILITATION – ENHANCEMENT - PRESERVATION



‘Restoration’ (Rehabilitation) Techniques/ Goals

- Fuel reduction/exotic thinning
- Jetty Jack removal
- Revegetation - mosaic
- ‘Bringing the Bosque Back to the River’
 - High flow channels, backwater channels
 - Bank terracing
 - Willow swales
 - Wetland restoration/recreation
 - Main goal – ‘*floodplain connection*’
 - *Within the current constraints of the system*

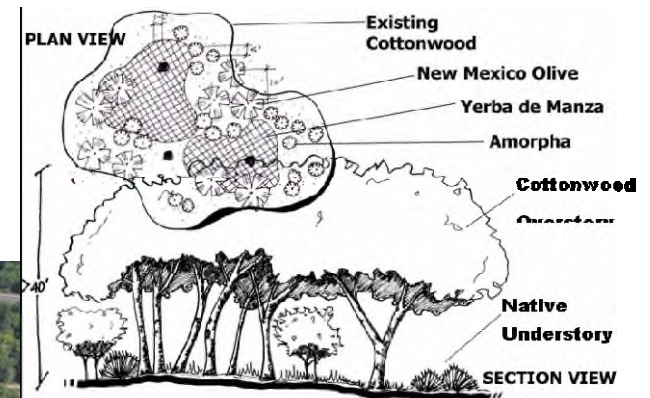
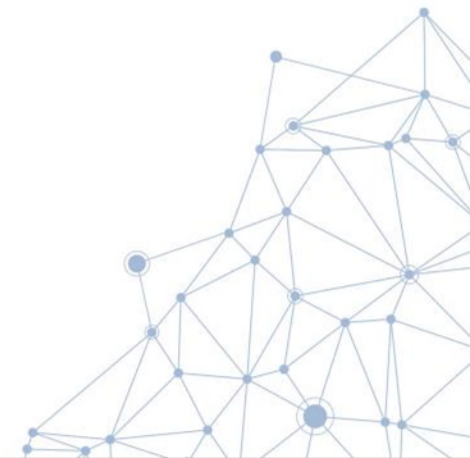
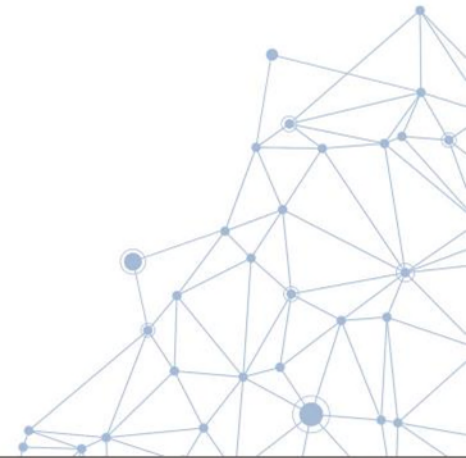


Figure 9. Schematic of a bosque forest



Hydrologic Notes from a Restoration Ecologist

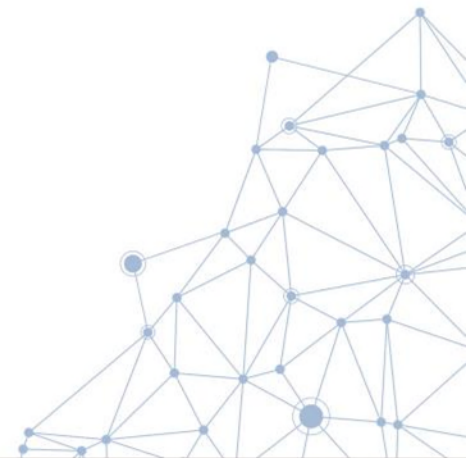


Peak flows

Description	Avg Peak Discharge/Flow	Note
Post-Cochiti Avg Annual Hydrograph	3,770 cfs	~2000-2010
Release capability (Cochiti)	6,000-7,000 cfs (was 10,000)	RR bridge, levee safety Belen Reach
Post-Cochiti Avg Annual Hydrograph	2,000-2,500 cfs	~2010-2015+
Last highest peak flow	6,780 cfs	2005
Max Release/Peak Flow	5080 cfs at Central	2023

USGS Rio Grande at Albuquerque

Don't forget about duration!



Albuquerque Overbank Project - 1998

*First **floodplain connection** project (with an ecosystem focus), and with monitoring component*



Let the river do the work!

Bring the bosque to the river



Peak flows: 1998 – 4,060 cfs; 1999 – 4,920
COA Open Space Division, Reclamation, NHNM
Long-term monitoring reporting; Muldavin et al.



Middle Rio Grande Endangered Species Collaborative Program (MRGESCP)

- Established in 2002
- Collaborative forum to support scientific analysis and implementation of adaptive management to benefit listed species within the Program Area
 - 30+ agencies, tribes, non-profits
- Rio Grande silvery minnow
- Southwestern willow flycatcher
- Yellow-billed cuckoo
- New Mexico meadow jumping mouse



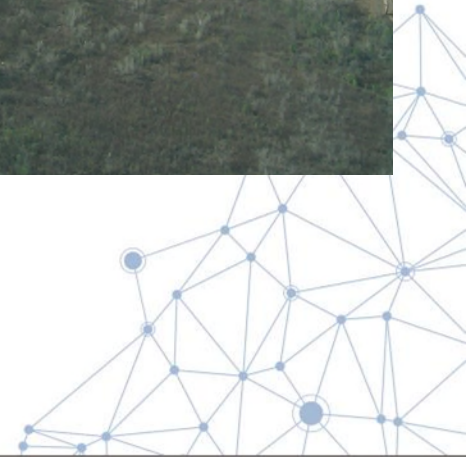
Los Lunas Habitat Restoration Project – 2002-2003

- April 2000 fire
- MRGESCP – Reclamation/USACE leads
- **Floodplain connection project**
 - Terraces
 - High flow and backwater channels
 - Swales
- Annual monitoring of vegetation, birds, groundwater



RGSM, SWFL

2002	2002-09-10	1,770
2003	2003-03-21	1,880
2004	2004-04-03	3,590
2005	2005-06-03	6,780



Rio Grande Nature Center Habitat Restoration Project - 2008

Finished construction before high flow

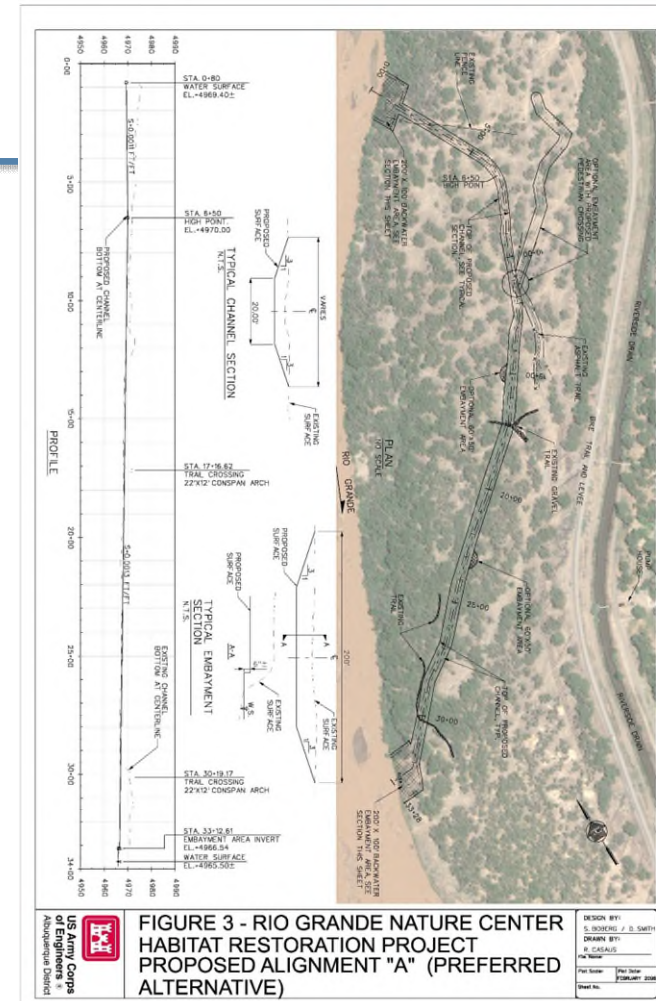


Peak flow:

2008 – 5,400

2009 – 4,940

2010 – 5,140



Peak flows:

2011 – 2,710

2012 – 2,510

2013 – 4,350

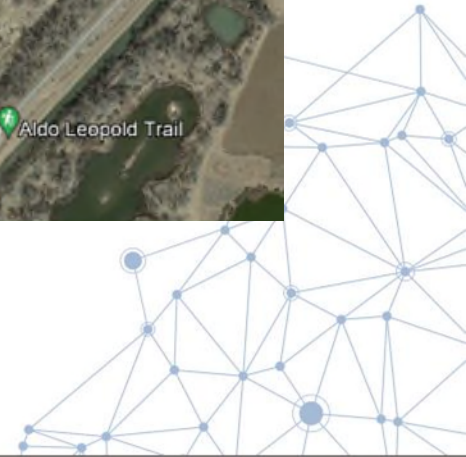
2014 - 3,770



Inlet - 2011



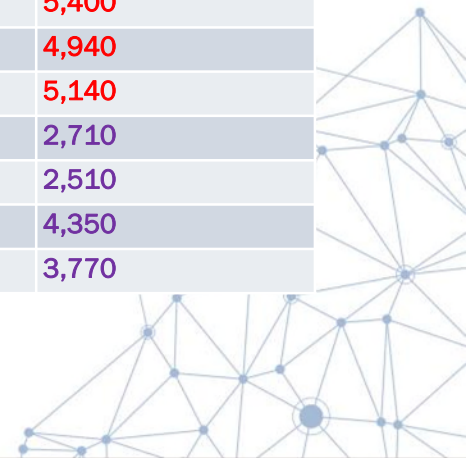
Inlet - 2014



Lessons Learned, 1998-2008+

- High flow channels
 - Peaks, durations
- Variable habitat
- Floodplain connection
‘gain’ – sediment removal
- Maintenance of native vegetation
- Invasive species management

Water Year	Date	Streamflow (cfs)
1997	1997-06-08	6,270
1998	1998-05-09	4,060
1999	1999-05-28	4,920
2000	2000-08-20	2,040
2001	2001-05-22	4,970
2002	2002-09-10	1,770
2003	2003-03-21	1,880
2004	2004-04-03	3,590
2005	2005-06-03	6,780
2006	2006-07-09	4,030
2007	2007-05-21	3,810
2008	2008-05-25	5,400
2009	2009-04-14	4,940
2010	2010-05-22	5,140
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2013	2013-09-13	4,350
2014	2014-08-02	3,770

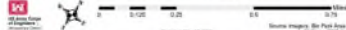


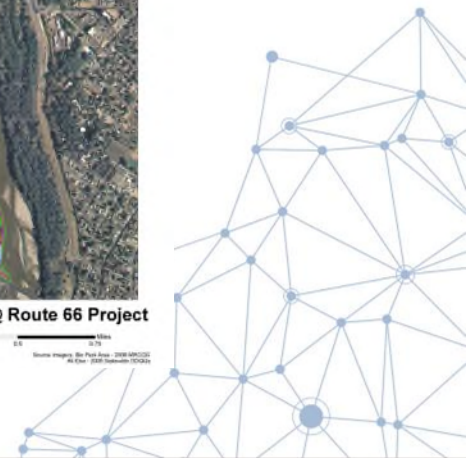
Ecosystem Revitalization @ RT66 - 2010

- Fuel reduction, exotic thinning
- Jetty jack removal
- *Floodplain connection* components:
 - High flow channel
 - Willow swale construction
 - (still not as much terracing/bank lowering)
- **Native Revegetation**



Ecosystem Revitalization @ Route 66 Project


 Source: Project, Site Plan Area, 2008 (MPC02)
 All Data: 2008 (MPC02)



Finished construction before 2010 high flow



Peak flows:

2010 – 5,140

2011 – 2,710

2012 – 2,510



MRGESCP Projects 2008-2012

- U.S. Bureau of Reclamation
- New Mexico Interstate Stream Commission
- U.S. Army Corps of Engineers
- Middle Rio Grande Conservancy District
- Tribal projects

Further testing of floodplain connection features



Lessons Learned, taken into Middle Rio Grande Restoration Project; 2011-2017

Taking forward design:

- a) Coordination of previous work and design features
- b) Floodplain connection overall 'gain'; options for managing soil removed
- c) Start of designing for lower flows
- d) Native vegetation options

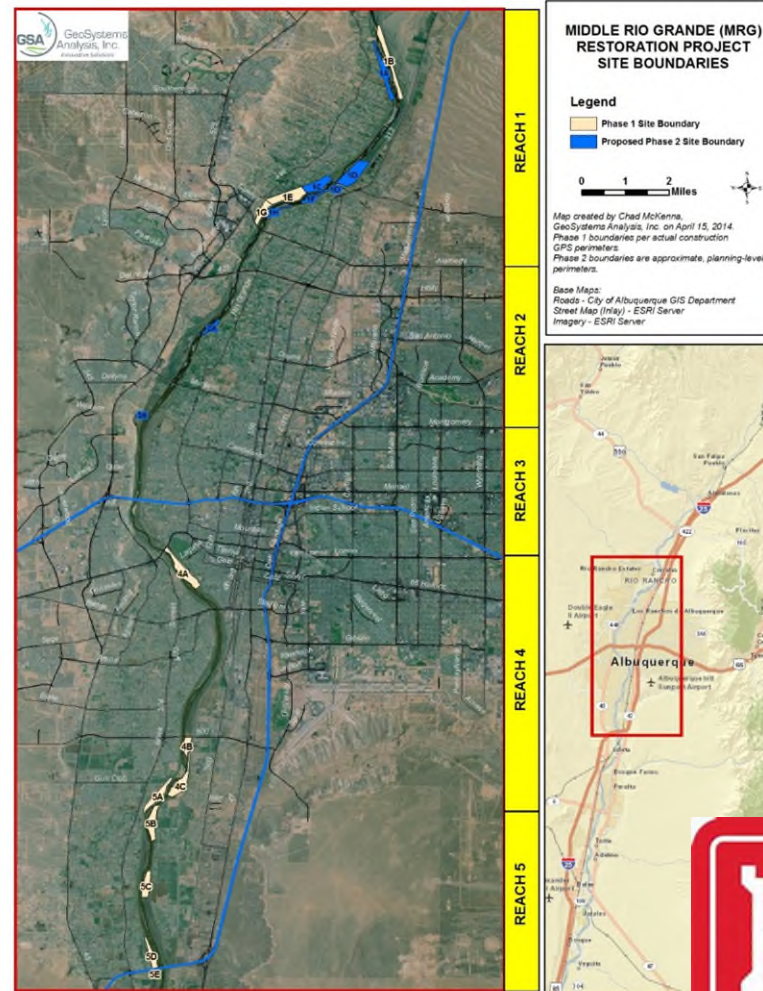
Floodplain edge; 300 ft corridor

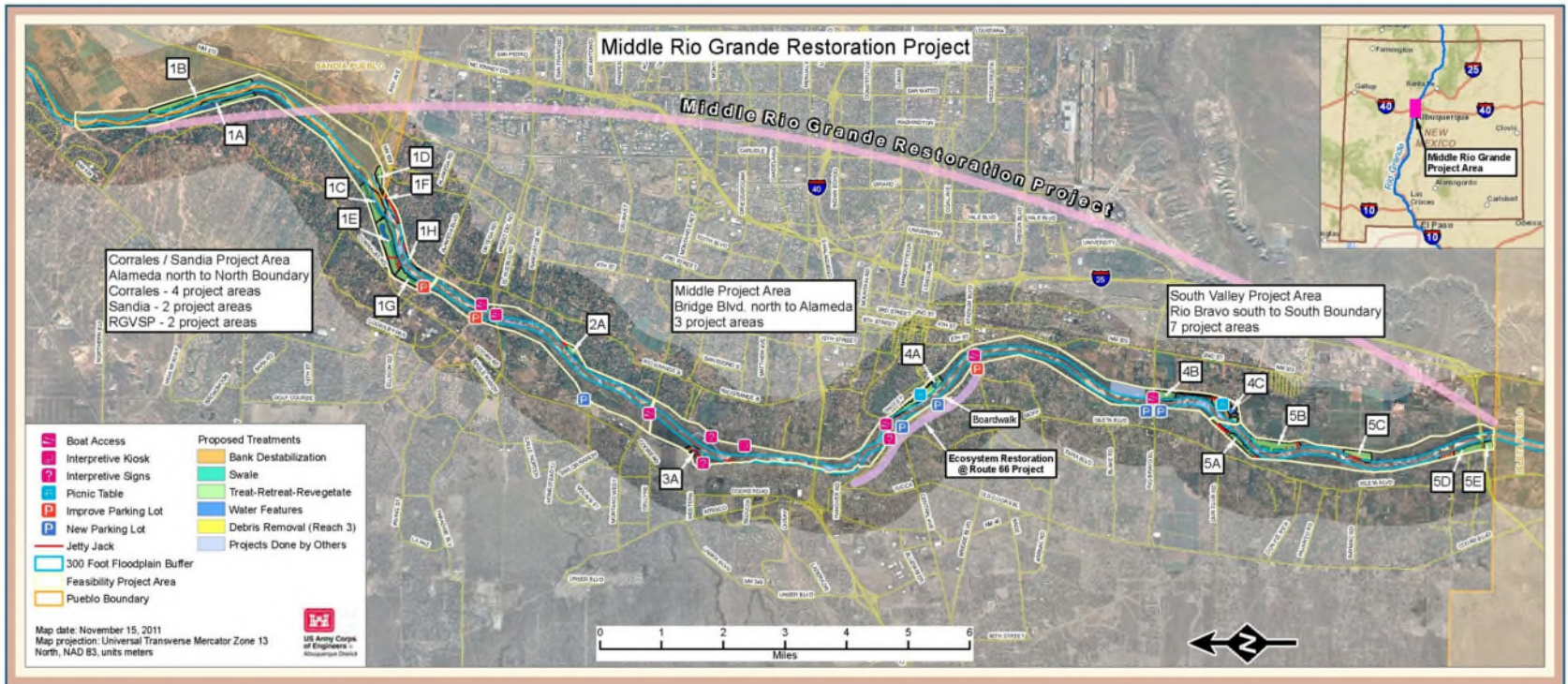


Middle Rio Grande Restoration Project

- 916 acres of restoration – floodplain connection focus; coordination with previous efforts
- Phase 1 (~600 acres) 2011-2014
- Phase 2 (~300 acres) 2014-2017
- Project sponsors:
 - Middle Rio Grande Conservancy District (MRGCD), Pueblo of Sandia, City of Albuquerque
- Other project stakeholders:
 - Village of Corrales
 - U.S. Bureau of Reclamation
 - City of Albuquerque Open Space Division
 - Pueblo of Sandia
- 5 years of follow up monitoring

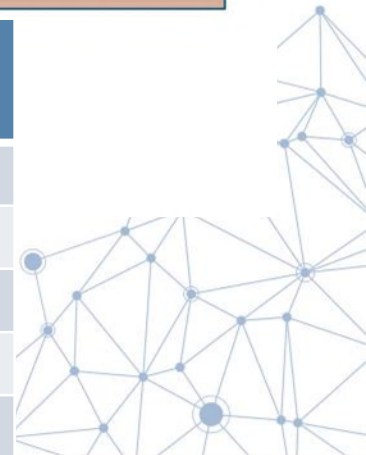
6 yrs





Phase I sites – construction 2011-2014; most completed by 2012 (4,350 cfs!)

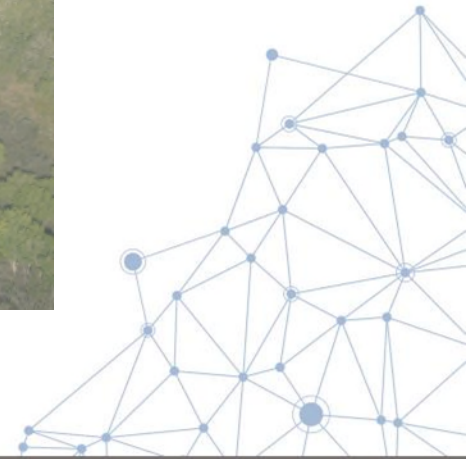
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1E Terrace - Swale




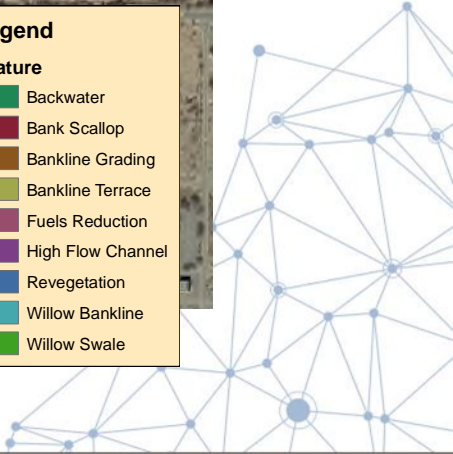
Peak flow:
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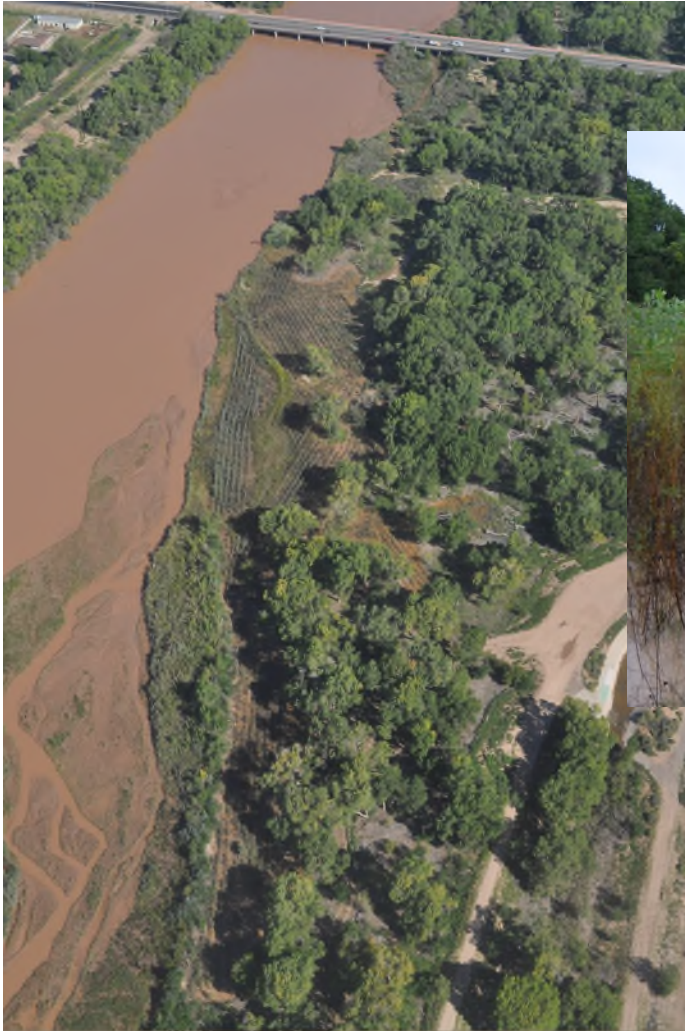


4B – Rio Bravo

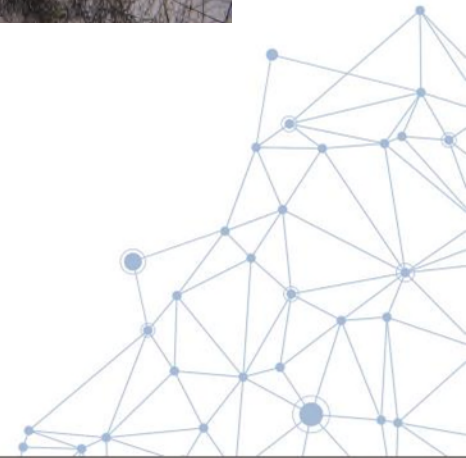


Legend	
Feature	
	Backwater
	Bank Scallop
	Bankline Grading
	Bankline Terrace
	Fuels Reduction
	High Flow Channel
	Revegetation
	Willow Bankline
	Willow Swale





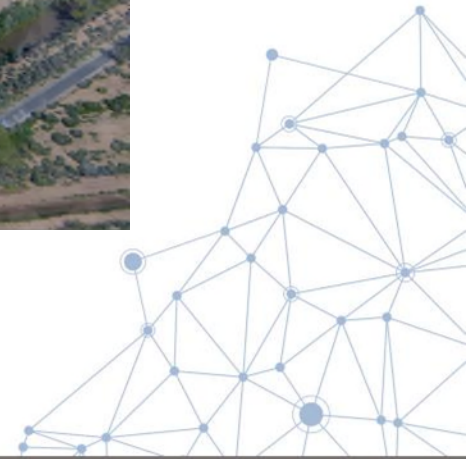
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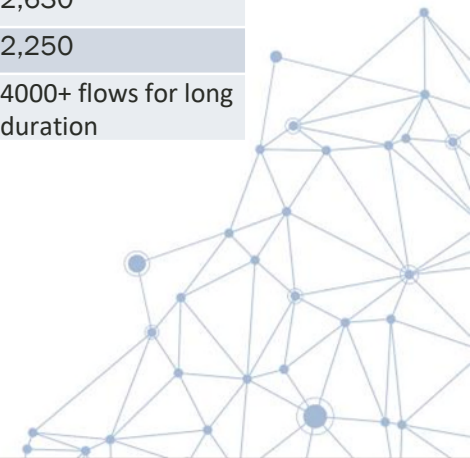
SWRP – connection at lower flows



Phase 2 Design

- **Design: 2013-2014**
 - Design flows ~2,500 cfs
- **Implementation: 2014-2017**
- **Sites:**
 - Corrales
 - Pueblo of Sandia
 - San Antonio Oxbow

Water Year	Date	Streamflow (cfs)
2010	2010-05-22	5,140
2011	2010-12-17	2,710
2012	2012-08-17	2,510
2013	2013-09-13	4,350
2014	2014-08-02	3,770
2015	2015-05-27	3,070
2016	2016-06-07	3,950
2017	2017-05-10	5,660
2019	2019-06-18	5,720
2020	2019-22-21	2,630
2021	2021-05-31	2,250
2022		4000+ flows for long duration



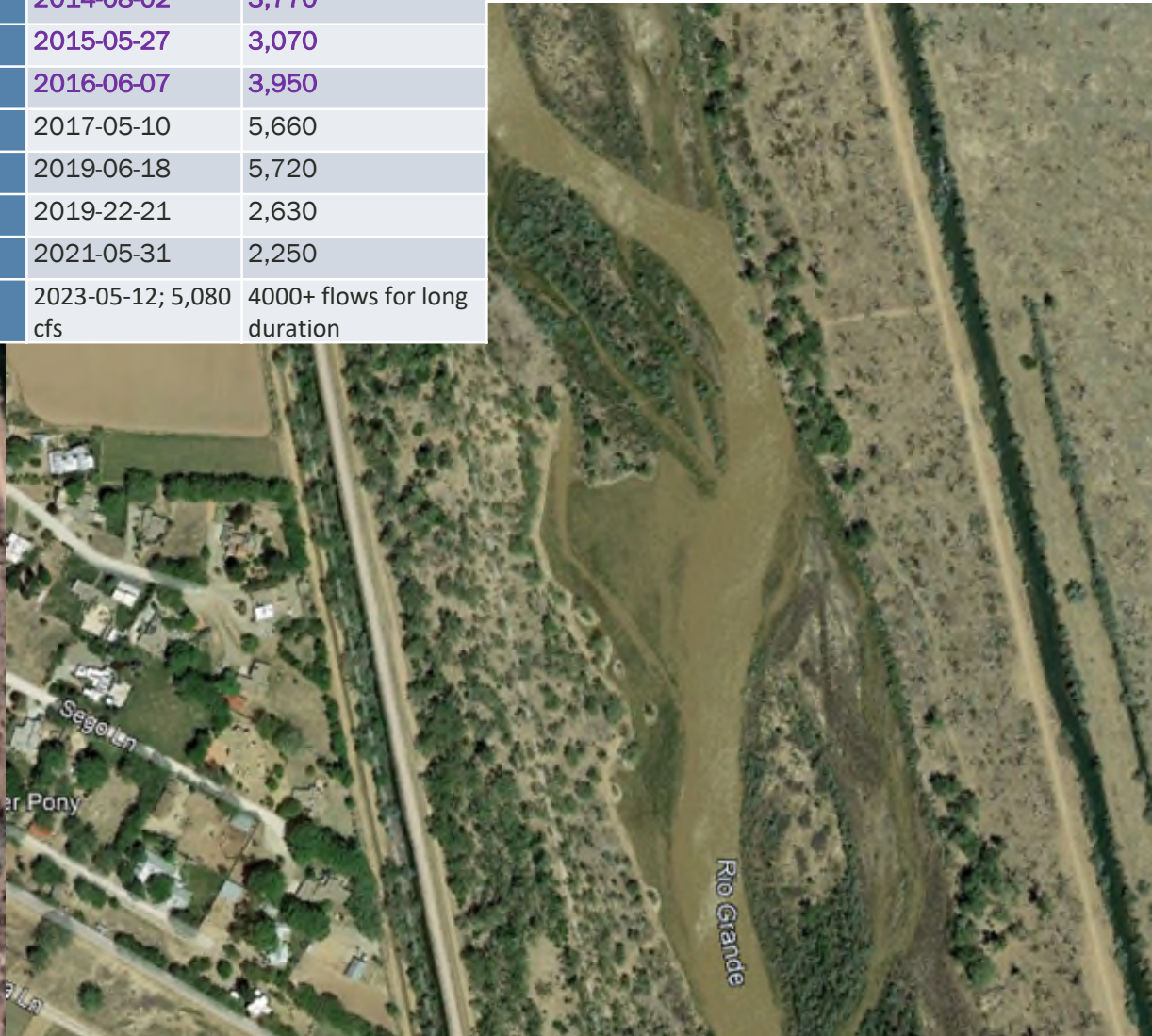
2014-2016



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2016	2016-06-07	3,950
2017	2017-05-10	5,660
2019	2019-06-18	5,720
2020	2019-22-21	2,630
2021	2021-05-31	2,250
2023	2023-05-12; 5,080 cfs	4000+ flows for long duration



**April 2016 (June 2016 3,950 cfs)
cfs**



April 2017 - (May 10, 2016 - 5,660)

Excavation quantity – field design change



MRG Restoration Monitoring

- Avian surveys
- BEMP – Bosque Ecosystem Monitoring Program
- High flow monitoring
- Feature changes – agg/deg; vegetation
- Threatened & Endangered Species:
 - WIFL, RGSM, YBCU
- Vegetation
 - Survival, transects, Hink and Ohmart mapping

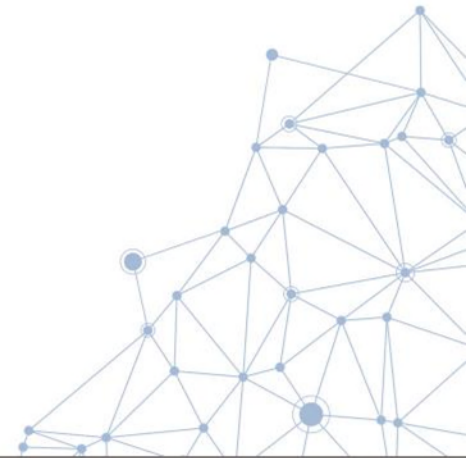


MRG: 5-10 yrs
RT66: 3-5 yrs
MRGESCP



Post Project Evaluation

- Operations & Maintenance
- Adaptive Management
- ‘sustainable’ while successional
- Evolution of habitat types
 - Let it be what it’s going to be
- When to O&M/AM



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Q&A Discussion



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