Conserving Native Rio Grande Fishes in Southern New Mexico and West Texas: A Conceptual Approach

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THE SOUTHWEST ENVIRONMENTAL CENTER
20 YEARS
1992 2012

Rio Grande pre-1870

- Perennial flows (most years)
- Peak flows—snow melt, summer rains
- Meandering, migrating channel
- Dynamic mosaic of floodplain habitats
- Flooding was a key process
- Abundant fish and wildlife

Oñate 1598

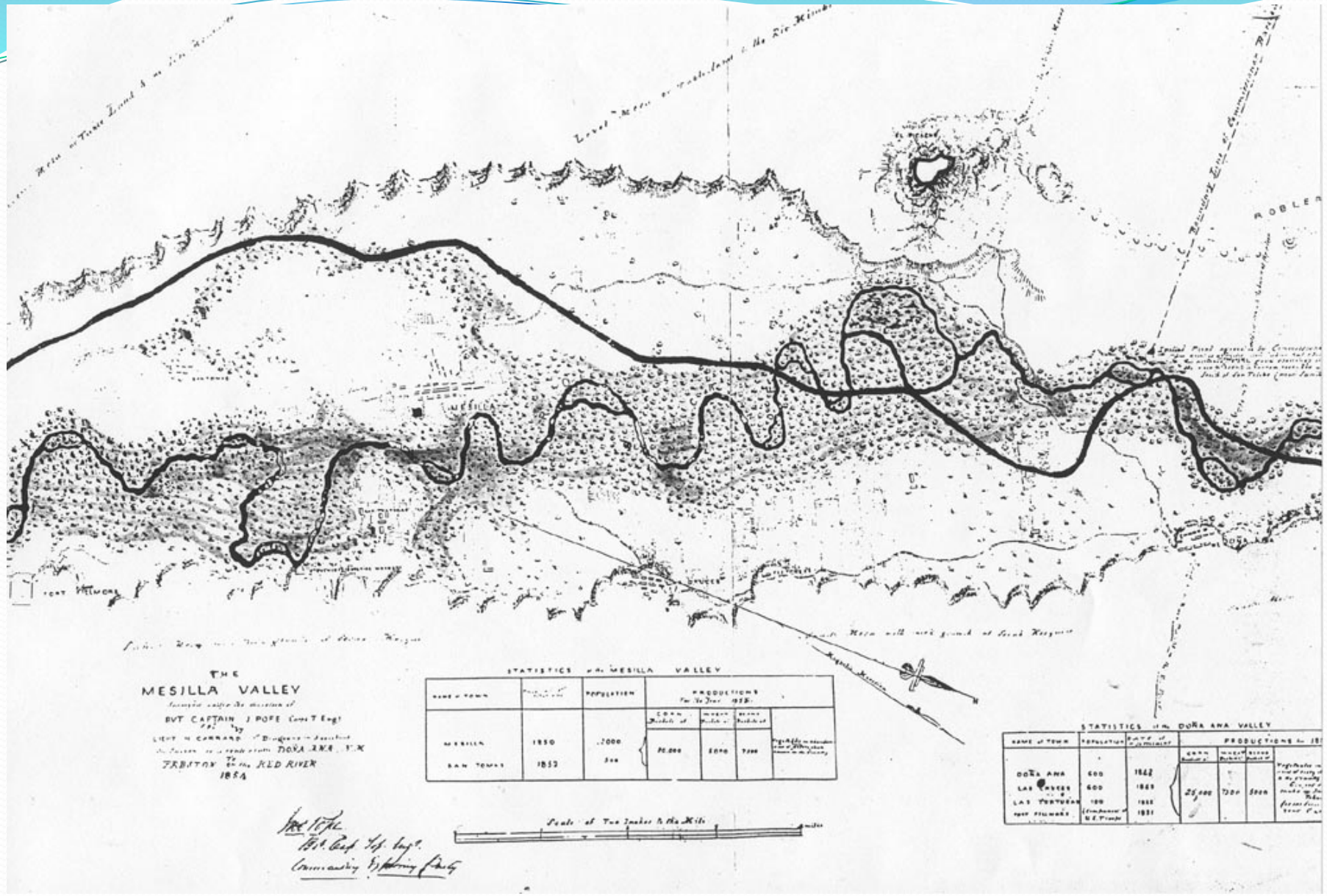
“Its beautiful waters teemed with many fish, and we easily caught a great number. The hunters then shot a large number of ducks and geese.”

Federal Rio Grande Project

- Elephant Butte Dam 1916
- Eliminated natural flows and flooding
- Today: 95% of natural runoff upstream of Rio Conchos consumed by irrigation and other uses

Federal channelization projects 1934-1943

- Meanders removed, banks armored, levees built
- Eliminated slow-water habitats important for fish spawning/nurseries


THE
MESILLA VALLEY
BVT CAPTAIN J POPE Corps T Engrs
LIEUT N CORBAND
DONA ANA N.M.
FRONTIER
RED RIVER
1854
STATISTICS of the MESILLA VALLEY
POPULATION
PRODUCTIONS
MESILLA
1850
2000
SAN TOMAS
1853
STATISTICS of the DONA ANA VALLEY
DONA ANA
600
1862
LAS CRUCES
600
1860
LAS TORTUGAS
100
1860
FORT FILLMORE
1851
25,000
7500
5000
Scale of Two Inches to the Mile

Presumed native fishes of the Rio Grande between Truth or Consequences, NM and Fort Quitman, Texas

Species	New Mexico			Texas		NM & TX
	Sublette et al. 1990	Stotz 2000	Carrasco 2009	Stotz 2000	Hendrickson & Cohen 2015	Smith & Miller 1986[1]
freshwater eel *Anguilla rostrata*	N	N	N	N	N	N
shovelnose sturgeon *Scapharhynchus platyrhynchus*	N	N	N	N	N	N
longnose gar *Lepisosteus osseus*	N		N			--[2]
gizzard shad *Dorosoma cepedianum*	N	N	N	N	N	--[2]
red shiner *Cyprinella lutrensis*	N	N	N	N	N	N
speckled chub *Macrhybopsis aestivalis*	N	N	N	N	N	N
Rio Grande chub *Gila pandora*	N	N	N			N
Rio Grande silvery minnow *Hybognathus amarus*	N	N	N	N		N
Rio Grande shiner *Notropis jemezanus*	N	N	N			N
Rio Grande bluntnose shiner *Notropis simus simus*	N	N	N	N	N	N
phantom shiner *Notropis orca*	N	N	N		N	N
fathead minnow	N	N	N			N
longnose dace *Rhinichthys cataractae*	N	N	N	N	N	N
river carpsucker *Carpiodes carpio*	N	N	N	N	N	N
Rio Grande blue sucker *Cycleptus sp*	N	N	N			N
smallmouth buffalo *Ictiobus bubalus*	N	N	N	N	N	--[2]
gray redhorse *Moxostoma congestum*	N		N	N	N	--[2]
Mexican tetra *Astyanax mexicanus*	N	N	N			--[2]
blue catfish *Ictalurus furcatus*	N		N		N	--[2]
channel catfish *Ictalurus punctatus* (?)						--[2]
flathead catfish *Pylodictus olivaris*	N	N	N		N	--[2]
western mosquitofish *Gambusia affinis*	N		N	N	N	--[2]
bluegill *Lepomis macrochirus*	N	N	N			--[2]
largemouth bass *Micropterus salmoides*				N	N	--[2]
Total # species	22	18	22	13	14	13

[1]Smith and Miller (1986) reported fish as native to lower and/or upper Rio Grande, with the upper Rio Grande the reach upstream of Del Rio, Texas (just downstream of historical Devils River confluence, now inundated by Amistad Reservoir) and the lower reach extended from Del Rio to Gulf of Mexico.

[2]Species native to lower Rio Grande per Smith and Miller (1986).

U.S. Fish and Wildlife Service:

"For spawning, nearly all of the fish species require quiet water of at least moderate (1 ft; 0.3 m) depth. This habitat is limited at any flow, and particularly at higher flows typical of the early irrigation season from March to June when most species spawn…*Lack of suitable spawning habitat is undoubtedly a major contributing factor to the poor condition of the Rio Grande fishery*."

From: Fish and Wildlife Coordination Act Report for the El Paso-Las Cruces Regional Sustainable Water Project. Submitted to the International Boundary and Water Commission. March, 2001.

"Native fishes and fish communities reflect environmental perturbations, are widely distributed, relatively well known, and presently declining, *so any successes in recovery are high-profile measures of progress in reversing degradation of physical, chemical, and biological features of aquatic ecosystems."*

W.L. Minckley et al, "Sustainability of western native fish resources," in *Aquatic Ecosystems Symposium, Report the Western Water Policy Review Advisory Commission*, September 1997.

Translation:

If the fish are gone, the river's probably screwed up.

If the fish come back, the river's probably getting better.

"Restoration of the natural flow regime is impossible. A novel hydrologic regime now exists and will exist in the future… *The challenge for bi-national societies is to define the desired characteristics of the associated novel aquatic and riparian ecosystems that can be created or rehabilitated on different parts of the watershed."*

Jack Schmidt, 2017

A conceptual approach to restoring native Rio Grande fishes

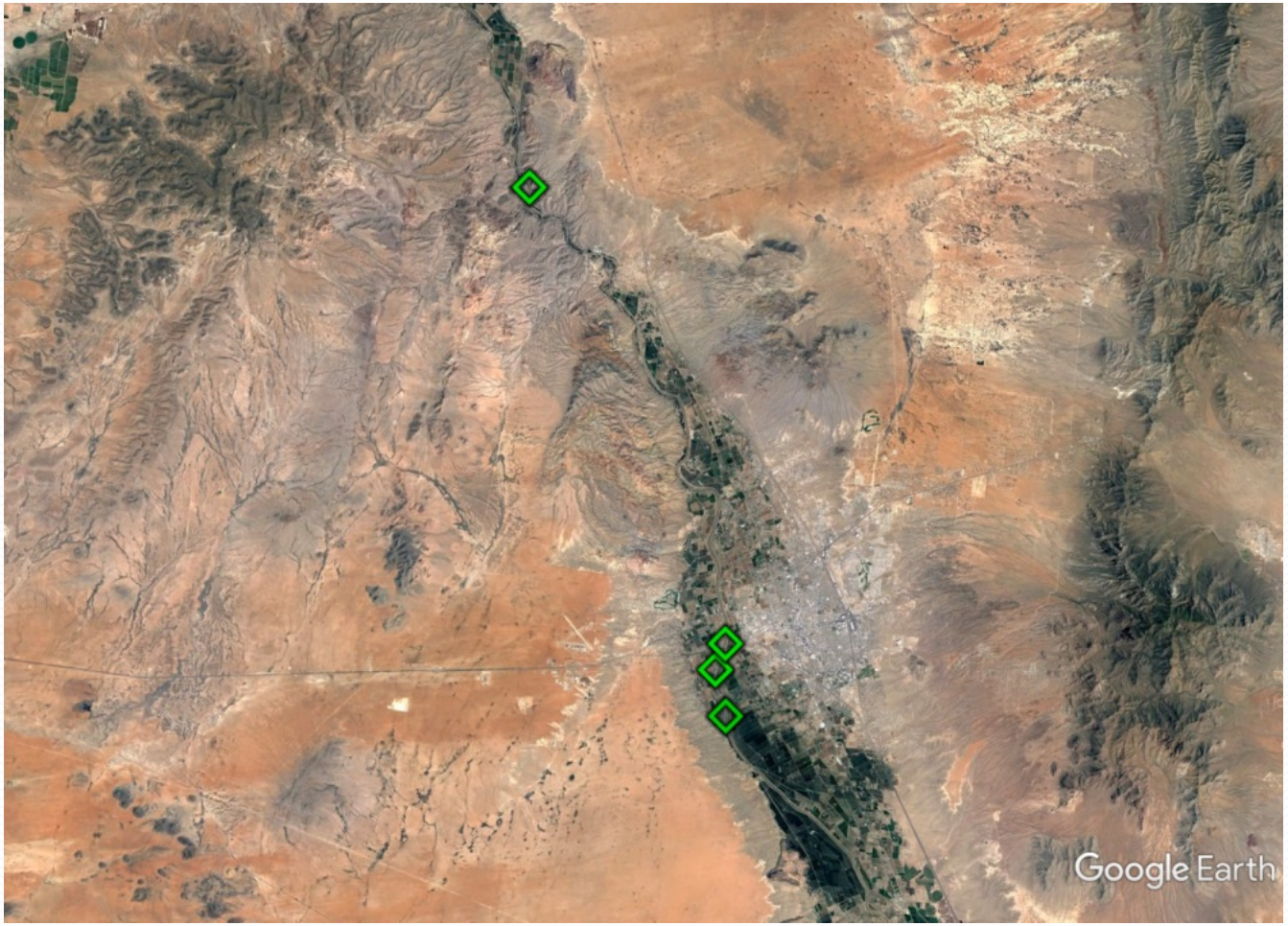
- Look at the whole system: river, floodplain, drains, etc.
- Take advantage of existing “wet spots”
- Create year-round refugial aquatic habitats that support small fish populations during non-irrigation season, and are connected to the river during irrigation season
- Many small populations = viable metapopulation

Advantages:

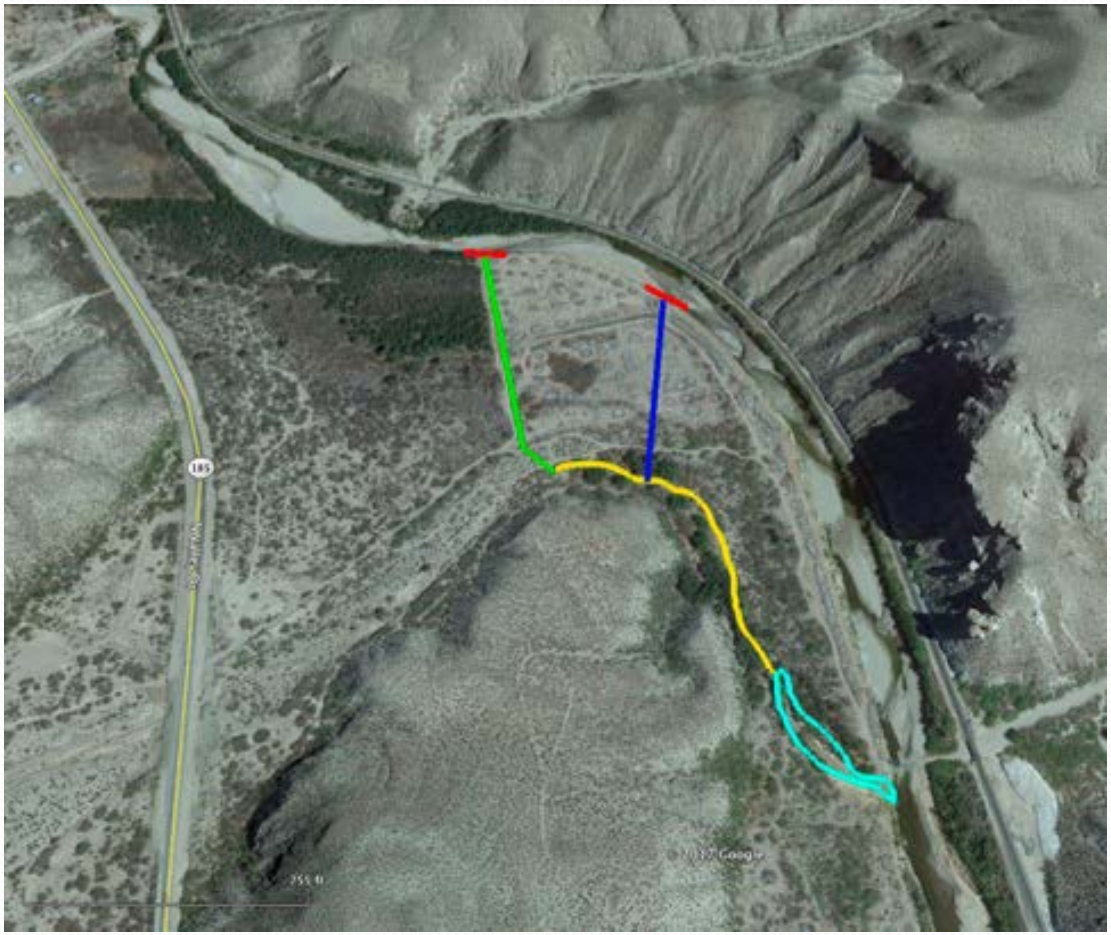
- Minimal alteration to current river management regime
- Mimics natural Rio Grande ecosystem
- Does not require year-round flows (=$$$)
- Does not require major changes to channel
- Does not rely on Endangered Species Act to restore native fishes

Disadvantages:

- Only works for some species
- May never provide enough habitat to support self-sustaining populations
- Requires high level of management intervention
- Does not really restore a functioning river system


Google Earth

Broad Canyon



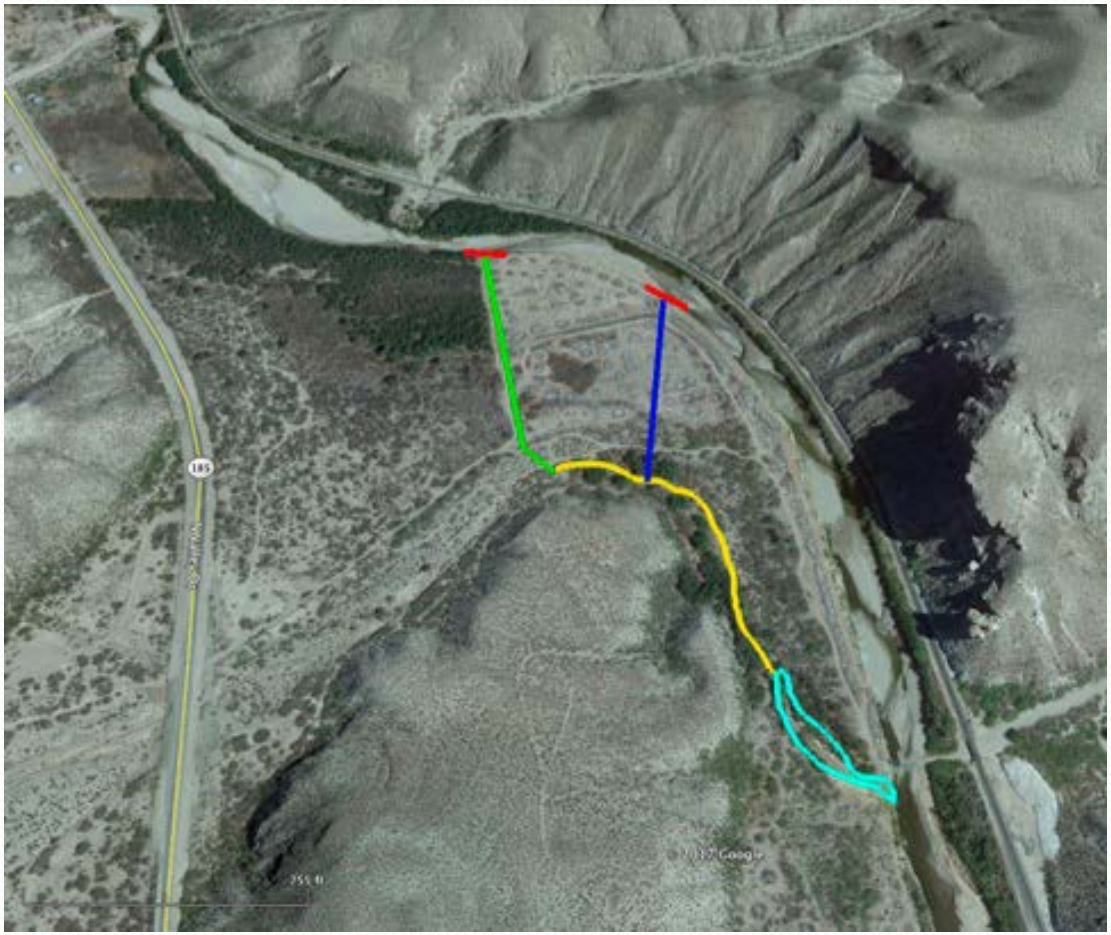
Options:

1. Replicate spring-fed tributary to river by diverting water to arroyo and enhancing arroyo habitat.
2. Same as #1, with closer diversion point.
3. No diversion, just embayment.

Features:

- Small diversion gate on west side of channel
- 8” PVC conveyance pipe
- Cobbles and boulders in excavated spring in arroyo
- Riffle habitat constructed at gradient breaks in arroyo with cobble and gravel
- Embayment width: 5-6 m at mid-length, 2 m at mouth

Broad Canyon



Species:

- Gizzard shad, red shiner, fathead minnow, longnose dace, river carpsucker, channel catfish, flathead catfish, western mosquitofish, bluegill, Mexican tetra (possibly).

Las Cruces Wastewater Discharge

Option #1:

- Realign existing discharge channel to replicate a spring-fed perennial tributary with pool/run/riffle habitats.

Features:

- Spring pool at head lined with cobble & boulders, shaded by willows
- Instream habitats: shoals (shallow, low velocity), runs, riffles (rapid velocity over gravel-cobble substrate)
- Length dictated by cost, ET losses
- Channel width: 1-3 m
- Depth: 10-125 cm
- Two-gate control structure at inlet to control flows
- Fish barrier at downstream end to exclude non-native species

Las Cruces Wastewater Discharge

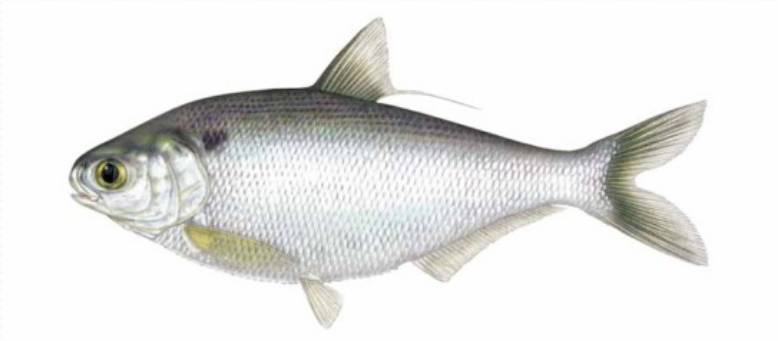
Option #2:

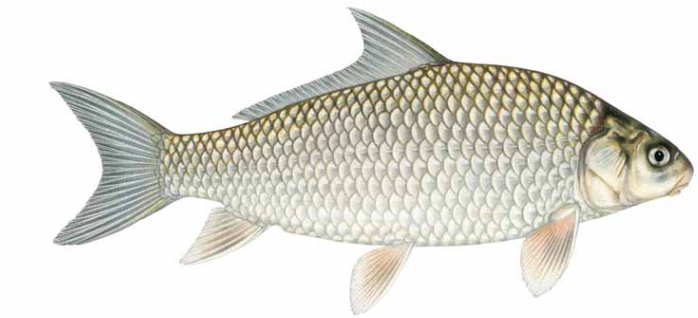
- Divert effluent into a constructed oxbow lake on floodway.

Features:

- Maximum depth: 1-2 m on eastern shore
- Two-gate control structure at inlet to control flows
- Continuous flow preferred
- Fish barrier at downstream end to exclude non-native species, or simple gated culvert
- Submerged cottonwood root wads

Las Cruces Wastewater Discharge





Fish species:

- Option #1: gizzard shad, red shiner, longnose dace, channel catfish, western mosquitofish, fathead minnow, Mexican tetra (possibly).
- Option #2: gizzard shad, channel catfish, western mosquitofish, largemouth bass, river carpsucker (possibly), longnose gar (possibly).

La Mancha Wetland

Option:

- Divert river into constructed pond when flows >= 1200 cfs.

Features:

- Groundwater fed pond (0.5-2.0 acres) on SWEC private land (max depth 2-3 m) w/emergent vegetation
- Gated 100' culvert through levee
- Dirt diversion channel across floodway
- Submerged cottonwood root wads

Fish species:

- Bluegill, gizzard shad, channel catfish, western mosquitofish, largemouth bass, fathead minnow, red shiner, longnose gar (possibly).

Mesilla Valley Bosque State Park

Option #1:

- Deepen and enhance existing Picacho Drain and associated resaca (ponds) to simulate oxbow between levee and river.

Features:

- Maximum depth of ponds: 4-5’
- Remove cattails from drain
- Existing gated culvert at inlet
- Stop-log structure at drain mouth
- Fish barrier at downstream end to exclude non-native species, or simple gated culvert
- Submerged cottonwood root wads

Mesilla Valley Bosque State Park

Option #2:

- Excavate backwater habitats on IBWC floodway to utilize water from Las Cruces treated effluent

Features:

- Located where greatest likelihood of surface water in non-irrigation season
- Will provide nursery habitat during irrigation season
- Annual sediment removal required

Mesilla Valley Bosque State Park

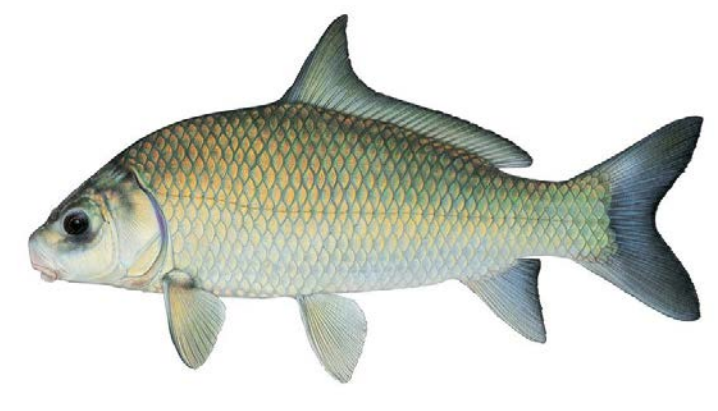
Option #3:

- Excavate side channel below Picacho Drain

Features:

- Aligned with historic river channel
- Will provide nursery/spawning habitat during irrigation season

Mesilla Valley Bosque State Park



Fish species:

- Option #1: bluegill, channel catfish, western mosquitofish, largemouth bass, river carpsucker, longnose gar, smallmouth buffalo, Mexican tetra, fathead minnow.
- Option #2: bluegill, western mosquitofish, other species.
- Option #3: red shiner, fathead minnow, western mosquitofish, largemouth bass, river carpsucker, flathead catfish, channel catfish, longnose gar, smallmouth buffalo.


La Mancha Wetland
Picacho Wetlands
Google earth
1996
Imagery Date: 5/2/2014 32°15'34.15" N 106°49'28.41" W elev 3884 ft eye alt 28274 ft

Recommendation made by the Good Neighbor Environmental Board (2014) to the President and Congress for ecological restoration along the U.S.-Mexico border:

> ***Include development of a science-based recovery plan for native Rio Grande fish from Caballo Reservoir (New Mexico) to Presidio (Texas) that balances the restoration of native fish and their habitats with the continued best management practices of the Rio Grande for all domestic and international obligations and requirements. (p. 52)***


www.wildmesquite.org
2004 Ken Stinnett