

Recovering the endangered Moapa Dace (*Moapa coriacea*)

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SOUTHERN NEVADA WATER AUTHORITY®

Recovering the Moapa Dace

- Collaboration between stakeholders
- Warm Springs Natural Area
- The Moapa dace and threats
- Restoration efforts at Warm Springs
 - Stream restoration
 - Invasive Species Control and Monitoring
 - Restoring Stream Connectivity
- Next Steps

Collaboration is key to species recovery

Muddy River Recovery Implementation Program

USFWS

SNWA

Moapa Valley Water District

Coyote Springs Investment

Moapa Band of Paiutes

Biological Advisory Committee

Nevada Department of Wildlife

US Fish and Wildlife Service

US Geological Survey

Coyote Springs Investment

Moapa Band of Paiutes

NV Energy

Clark County

The Nature Conservancy

White River Flow System

- Eastern Nevada is drained by a small and discontinuous 200 mile long river
- Flowed during the Pleistocene but now mostly dry with subsurface flow
- Several aquatic endemic species are found in remnant springs, streams, and lakes
- The Muddy River begins at Warm Springs and flows into Lake Mead



Memorandum of Agreement

- SNWA, US Fish and Wildlife, Coyote Springs Investment LLC, Moapa Valley Water District, Moapa Band of Paiutes
- Purpose: To Establishment of management and mitigation measures designed to protect and recover the Moapa dace while allowing regional municipal and industrial groundwater development to proceed
- Dedication of 10% of Coyote Springs Investment LLC's existing water rights to Moapa dace recovery.
- Dedication of MVWD Jones Spring Right of 1 cfs (724 afy) as a pass through flow to allow for the augmentation of habitat

Memorandum of Agreement (cont.)

- Establishment of a Recovery Implementation Program
- Development of an Ecological Model for the Moapa dace
- Establish Hydrologic Review Team
- Redistribute and/or reduce pumping if spring flows decline
- Habitat Restoration and Recovery Measures Including:
 - Restoration of the Apcar unit of the Moapa National Wildlife Refuge
 - Habitat restoration off of the MNWR
 - Funding for fish barriers
 - Funding for the eradication of non-native species

Warm Springs Natural Area

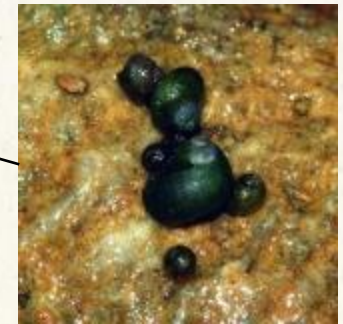
- Purchased in 2007 by SNWA, funded by the Southern Nevada Public Land Management Act (SNPLMA) Parks, Trails and Natural Areas Program.
- WSNA acquired to protect and recover the Moapa dace whose habitat is tied to the regional carbonate springs
- Stewardship Plan guides property management and lays out SNWA's commitments
- WSNA is 1,220 acres
- Will be open in the future for limited public access



Aquatic Species of Concern in the Warm Springs Area

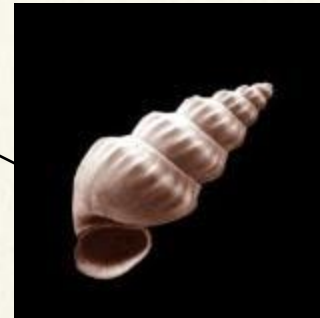
Endemics

- Moapa dace (*Moapa coriacea*)
- Moapa White River springfish (*Crenichthys baileyi moapae*)
- Moapa naucorid (*Limnocoris moapensis*)
- Moapa riffle beetle (*Microcyllloepus moapus*)
- Moapa Warm Springs riffle beetle (*Stenelmis moapa*)
- Moapa pebblesnail (*Pyrgulopsis avernalis*)



Rare non-endemics

- Moapa Valley pyrg (*Pyrgulopsis carinifera*)
- Grated tryonia (*Tryonia clathrata*)
- Western naucorid (*Ambrysus mormon*)
- Pahrnagat naucorid (*Pelocoris biimpressus shoshone*)



The Moapa dace (*Moapa coriacea*)

- Cyprinidae family
- Only species in the genus *Moapa*
- Officially described in 1948; but was known before then and was considered “common” in 1933
- Occurred in spring pools, outflow streams, and main river
- Typically found in swift, warm (27°C to 32°C) water
- Small (~3½ inches long)
- Small scales, leathery
- Dark spot on tail



Moapa Dace Recovery Goals (US Fish and Wildlife)



1. 6,000 adult Moapa dace are present in the five spring systems and the Upper Muddy River for 5 consecutive years.
2. Ensure instream flows and historical habitat in 3 of the 5 spring systems have been protected.
3. 75% of historical habitat in the five spring systems and the Upper Muddy River provide Moapa dace spawning, nursery, cover and/or foraging habitat.
4. Moapa dace population is comprised of 3 or more age classes and reproduction and recruitment is documented from 3 of the 5 spring systems.
5. Nonnative fish and parasites no longer adversely affect the long-term survival of Moapa dace.

Threats to the Moapa Dace

- Invasive species
 - California palms (*Washingtonia filifera*)
 - Western mosquitofish (*Gambusia affinis*) introduced before 1938
 - Shortfin mollies (*Poecilia mexicana*) introduced 1963
 - Blue tilapia (*Oreochromis aureus*) introduced about 1995
 - Ellgrass (*Vallisneria spp.*)



Threats to the Moapa Dace (cont.)

- Irrigation diversions
 - Barriers to movement
 - Fish entrainment
- Recreation Development
 - Springs developed for swimming
 - Pool chlorination
- Groundwater development



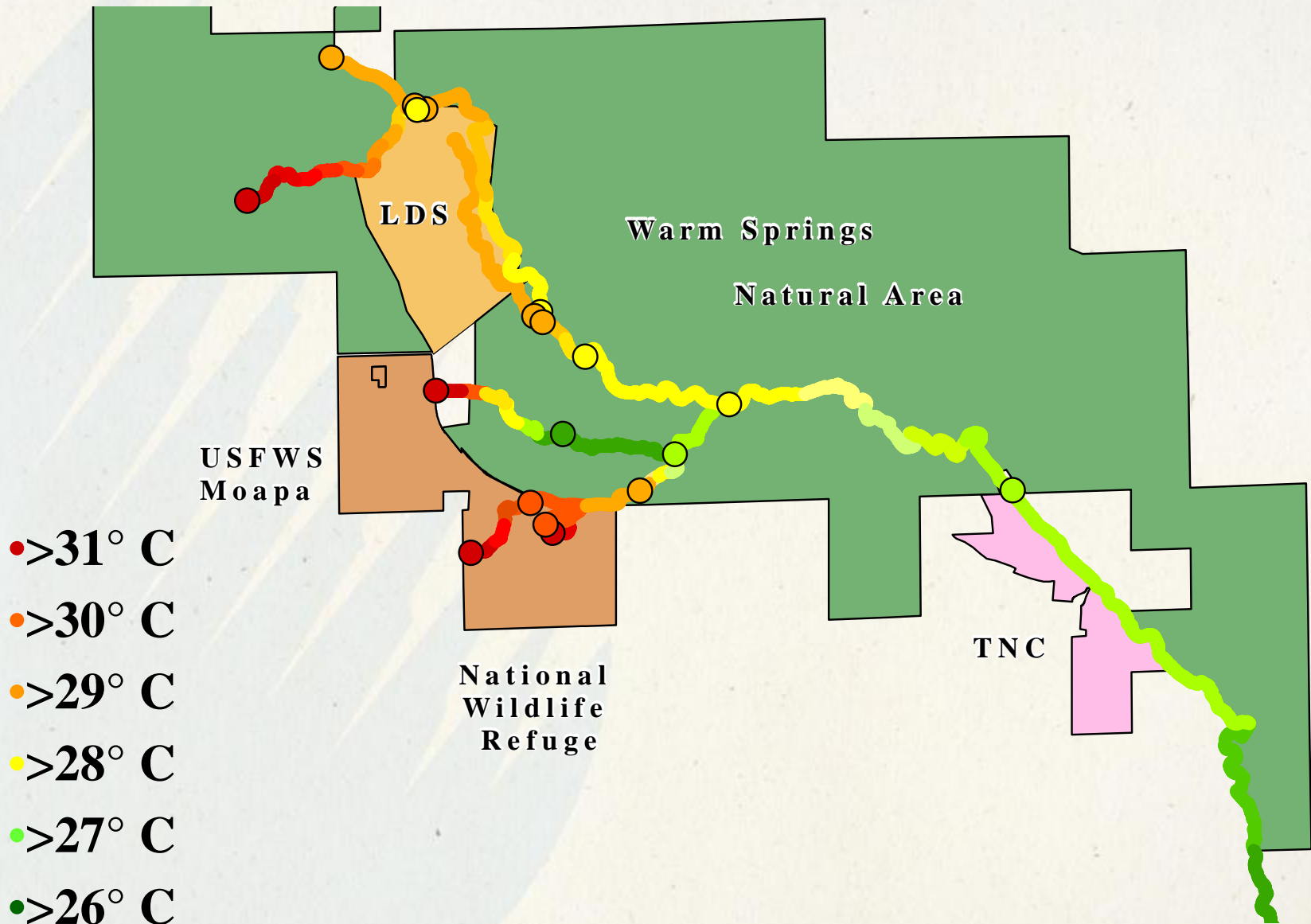
Threats to the Moapa Dace

Habitat changes

- Entrenchment and headcutting
- Thermal temperatures cooling - due to ponding, sheetflow, and coldwater inflows

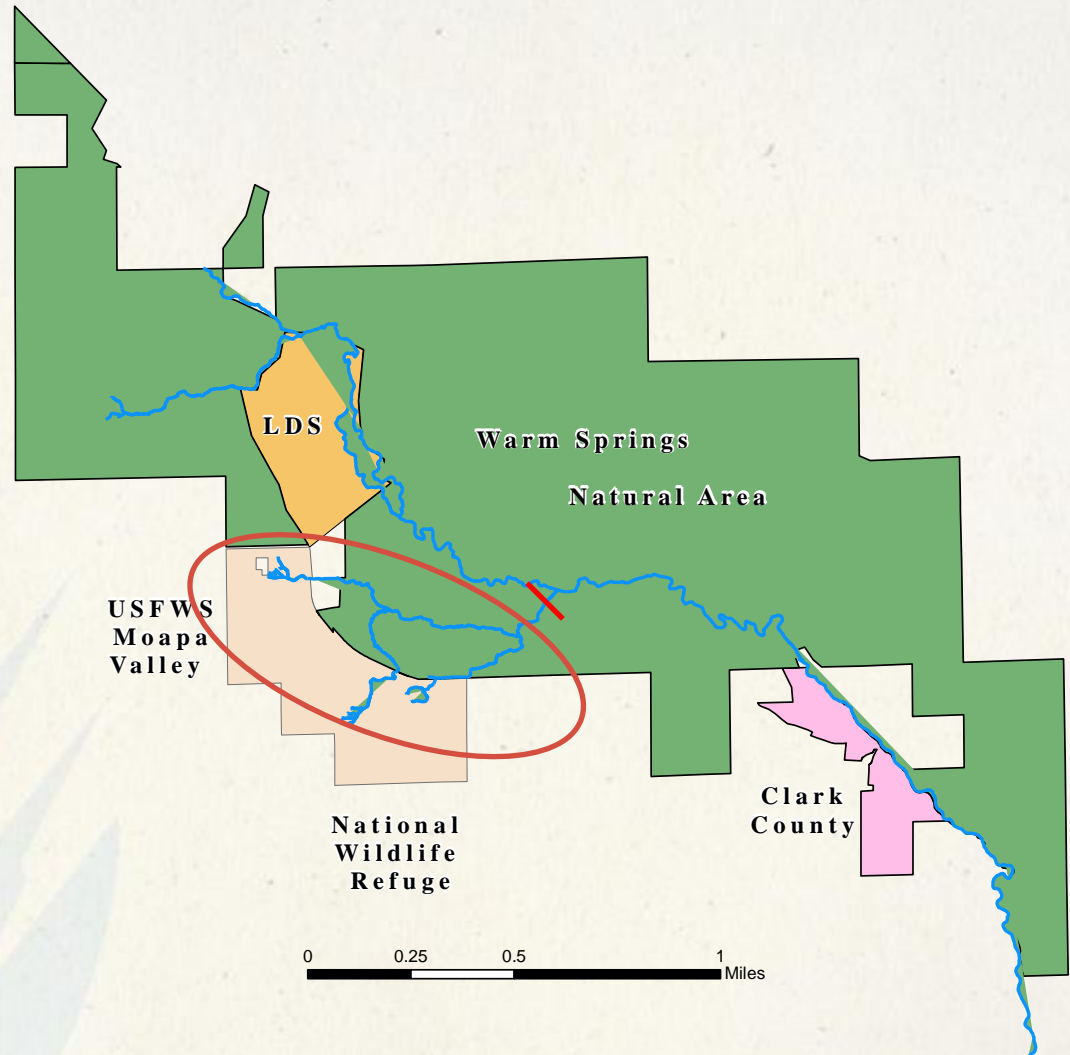


Thermal Problems (2008)

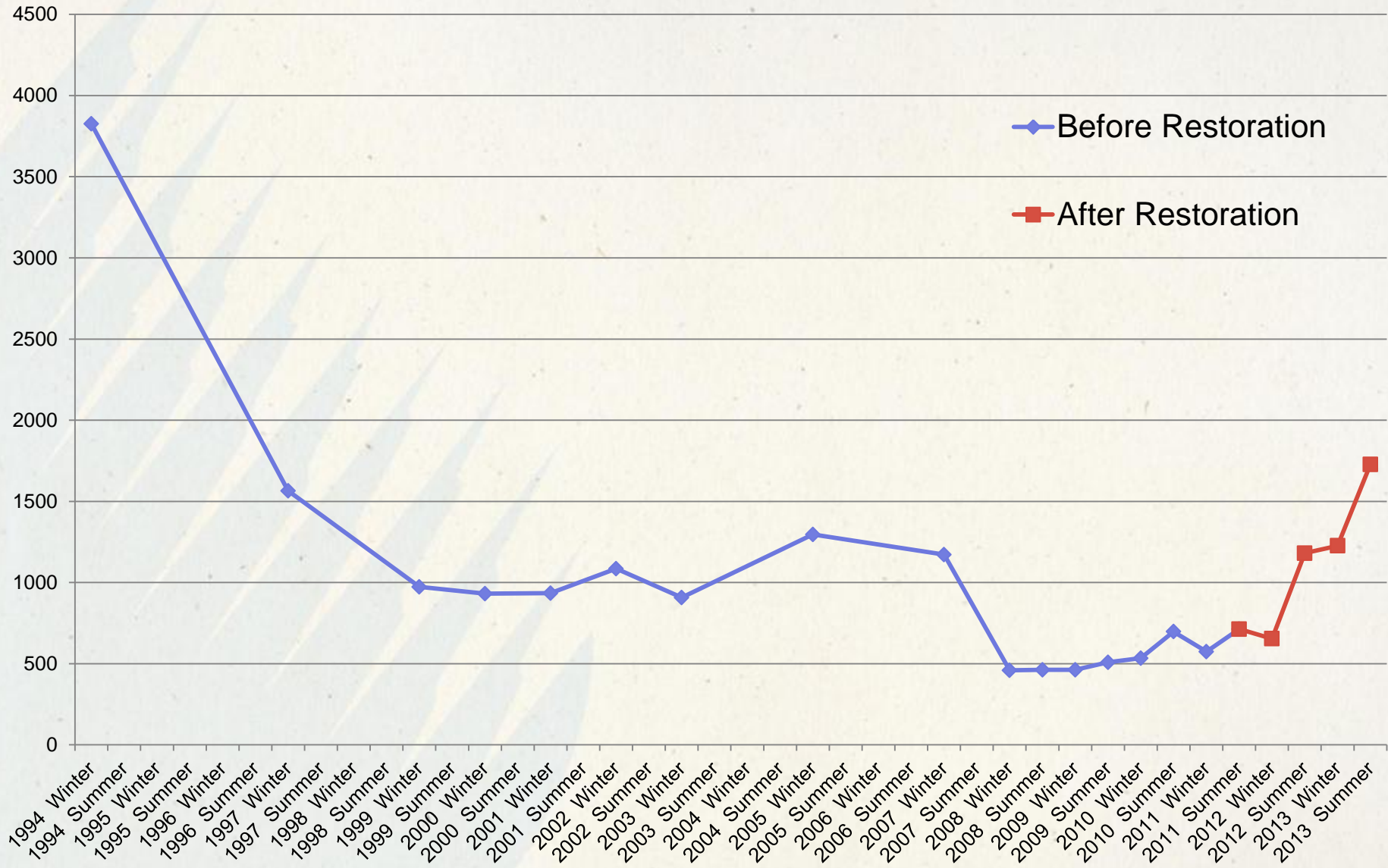


Warm Springs Natural Area

- Moapa dace historically were found throughout the entire Warm Springs Natural Area.
- Moapa Valley National Wildlife Refuge began land and water purchases in 1979. The Refuge protects three major springs and their outflow streams.
- In 1998, USFWS personnel constructed a fish barrier on adjacent ranch land to prevent blue tilapia from entering the Refuge.
- All Moapa dace still occur in this area.



Moapa Dace Numbers 1994-2013



Moapa Dace Restoration Efforts on WSNA

- Stream Restoration
 - Pederson Stream (2008)
 - Apcar Stream (2011-2012)
- Invasive Species Control
 - Tilapia
 - Palms
 - Eelgrass
- Impending Threats
 - Red shiner (*Cyprinella lutrensis*)
 - Red-swamp crayfish (*Procambarus clarkii*)

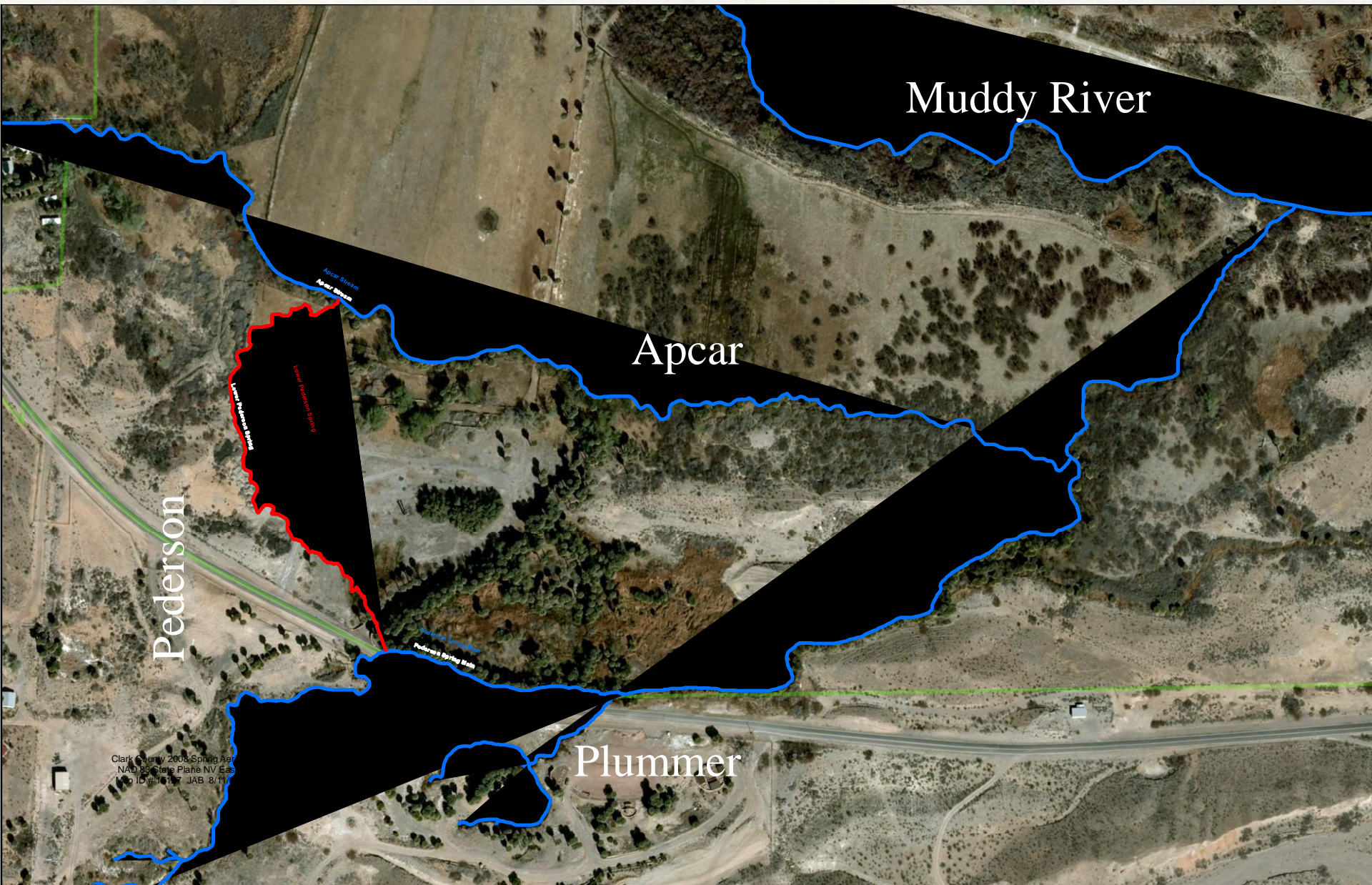


Lower Pederson Project (2008)

- Pederson Stream had been diverted for irrigation
- Dense palms growing in the channel caused sheet flow and cooling
- New channel constructed towards the historic location



Lower Pederson Project (2008) Biological Advisory Committee recommended SNWA funded



Lower Pederson Project (2008)



Lower Pederson Project (2008)



Lower Pederson Project

11/2008

6/2009

8/2009



November 2008

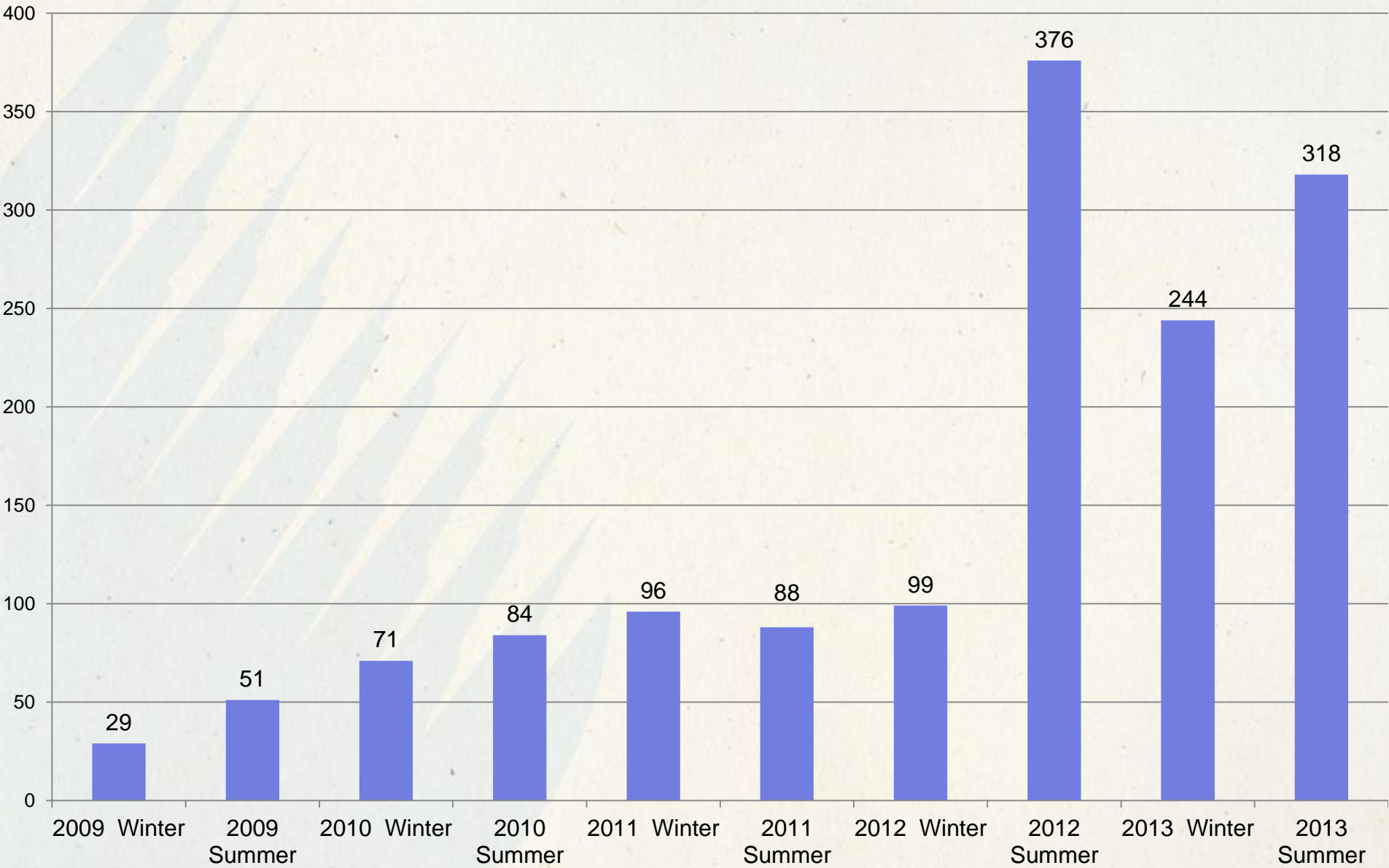


June 2009



August 2009

Moapa Dace Numbers Lower Pederson Stream 2009-2013



Apcar Restoration 2011-2012



**Before
Restoration:
Wide, shallow
channel with
slow flow**



**After
Restoration:
Narrow, deep
channel with
rapid flow**

Apcar Restoration 2011-2012



Apcar Restoration 2011-2012



Apcar Restoration 2011-2012

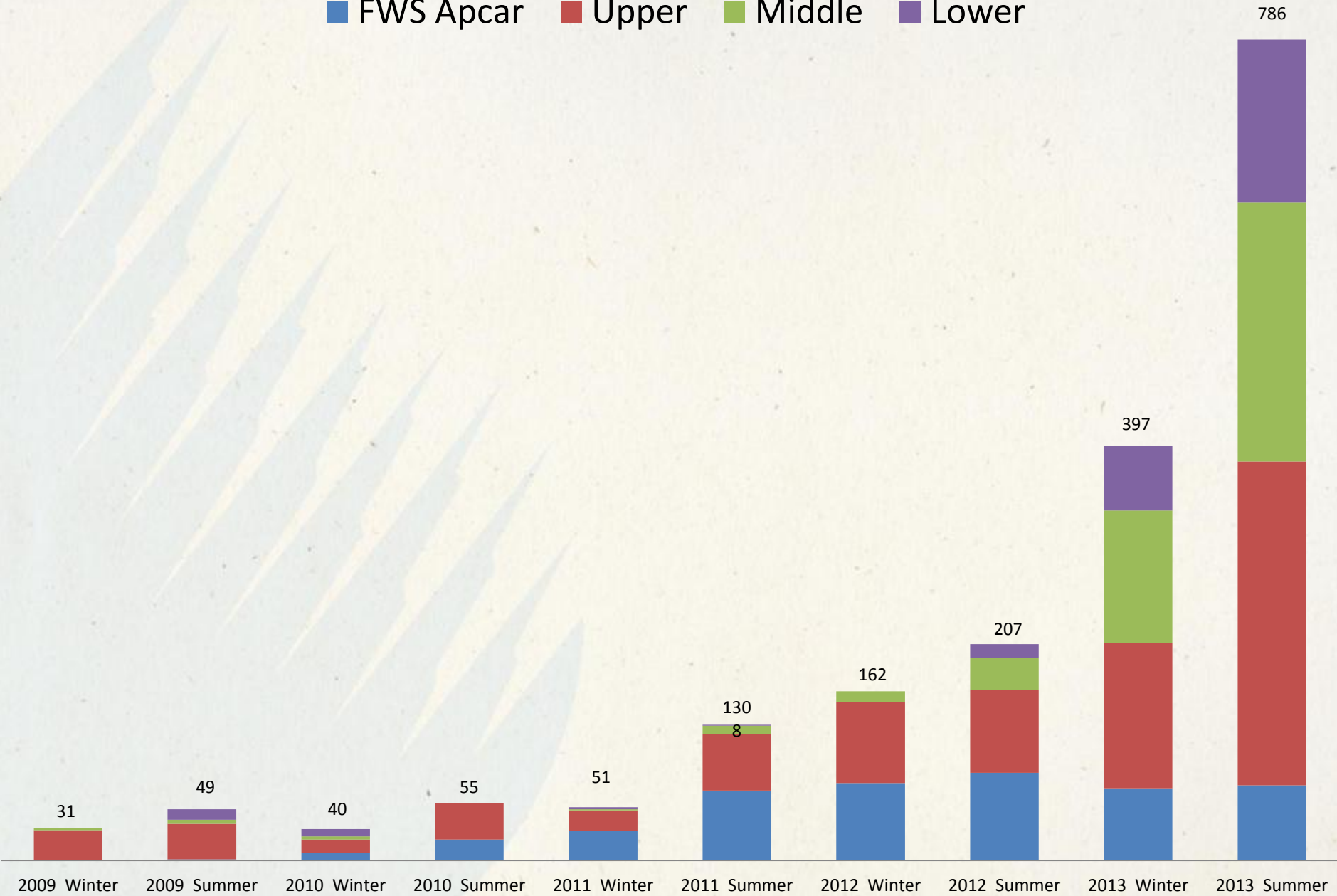


Apcar Restoration 2011-2012



Moapa Dace Numbers Apcar Stream 2008-2013

■ FWS Apcar ■ Upper ■ Middle ■ Lower

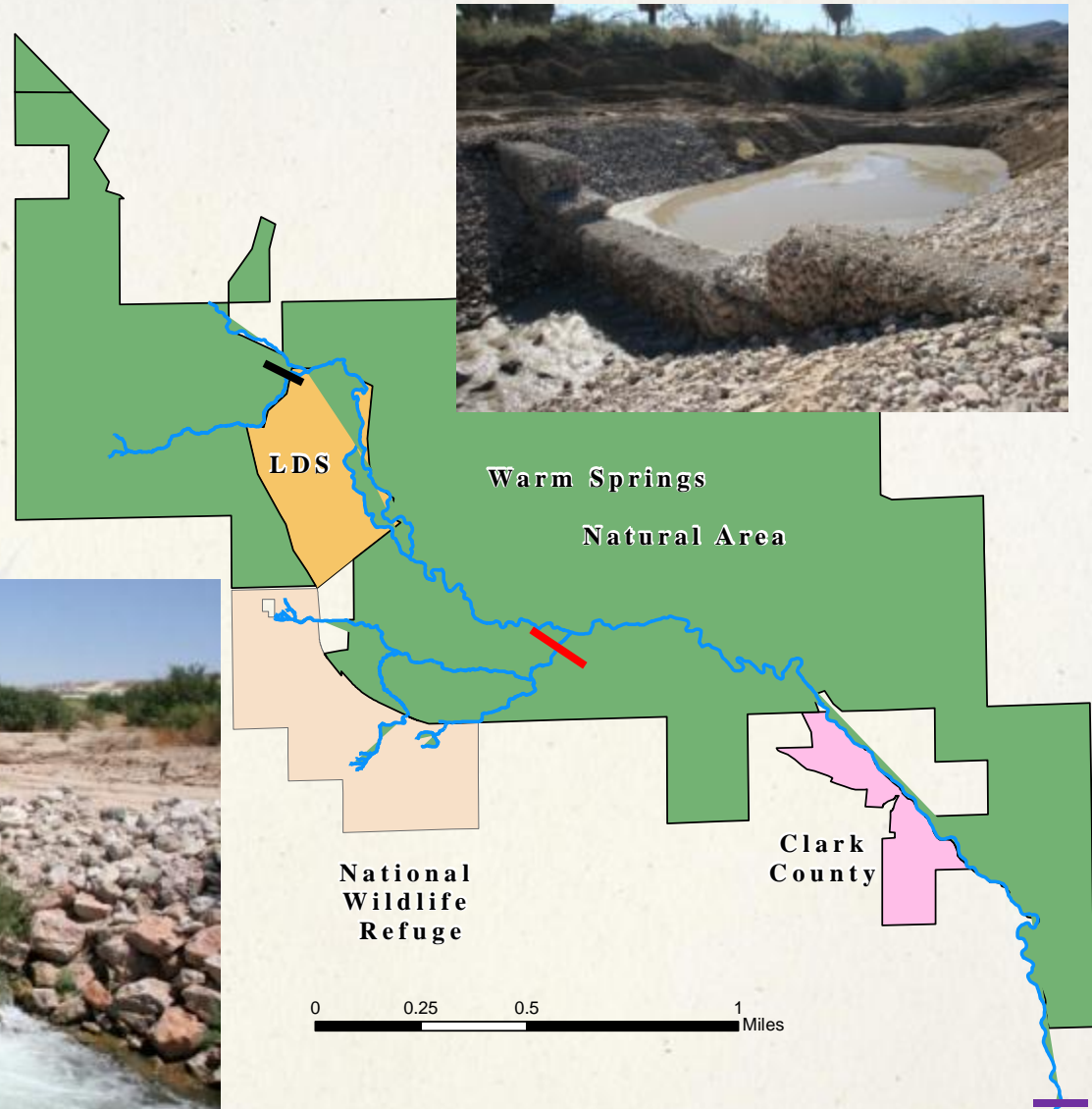


Fish Barriers and Tilapia Control Efforts

— 1998 Gabion Fish Barrier installed on Refuge Stream

— 2007 BLM Fish Barrier installed as a downstream anchor to prevent fish from entering the area

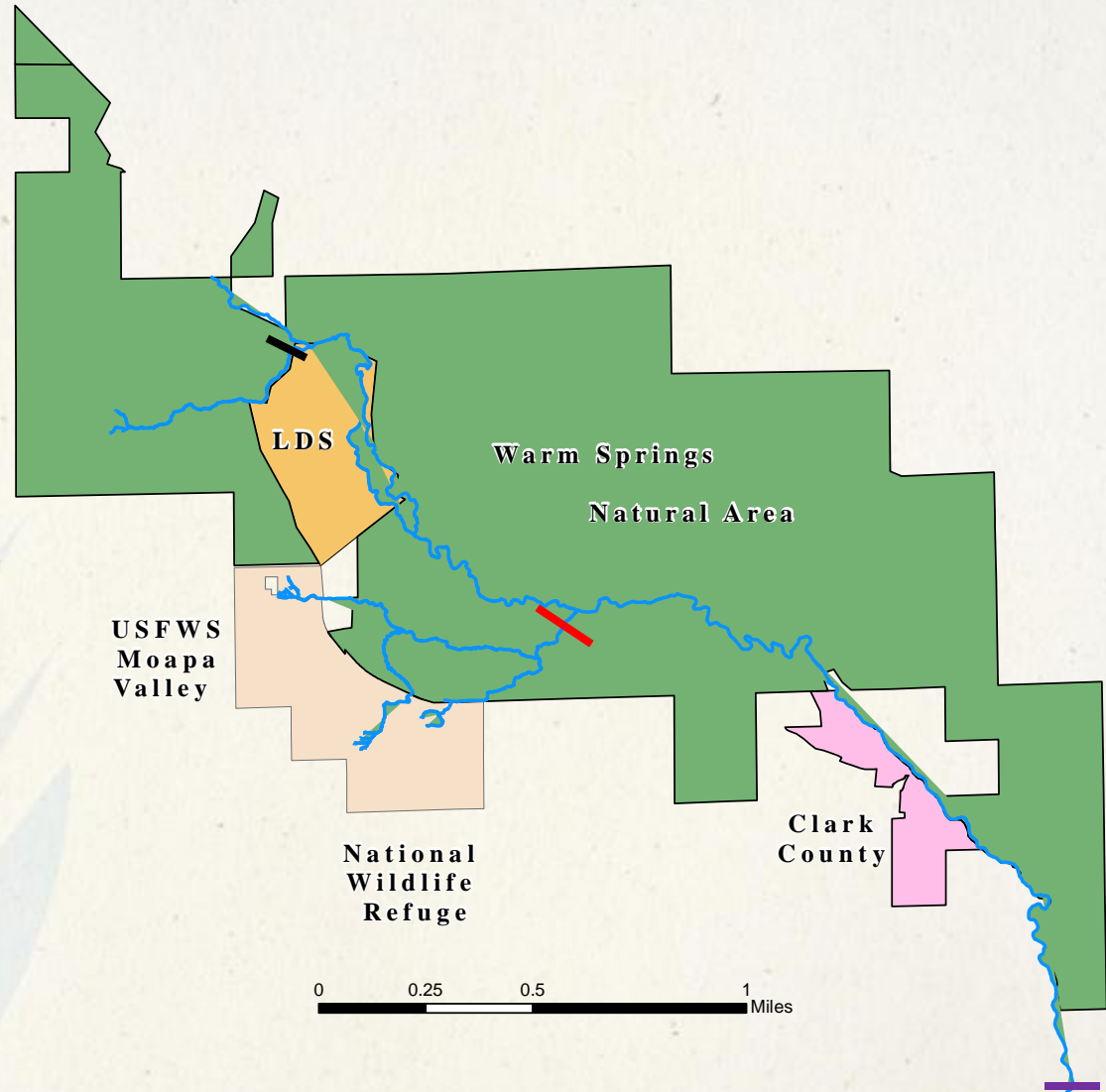
— 2008 South Fork Fish Barrier installed to facilitate tilapia removal on the South Fork



Fish Barriers and Tilapia Control Efforts

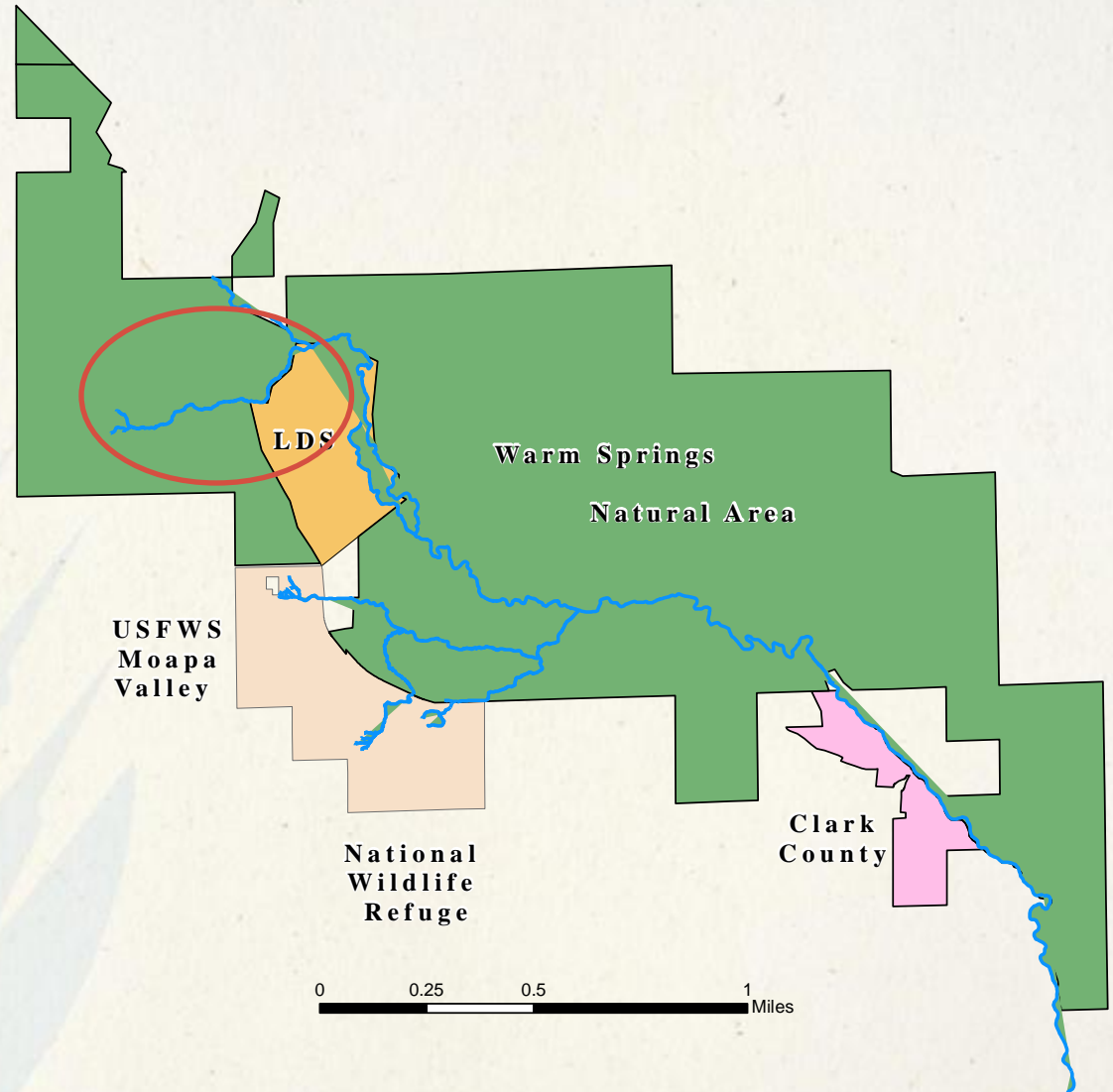
— Should get funding for removable fish barrier in 2014

— Planning to retrofit BLM Barrier to resist crayfish



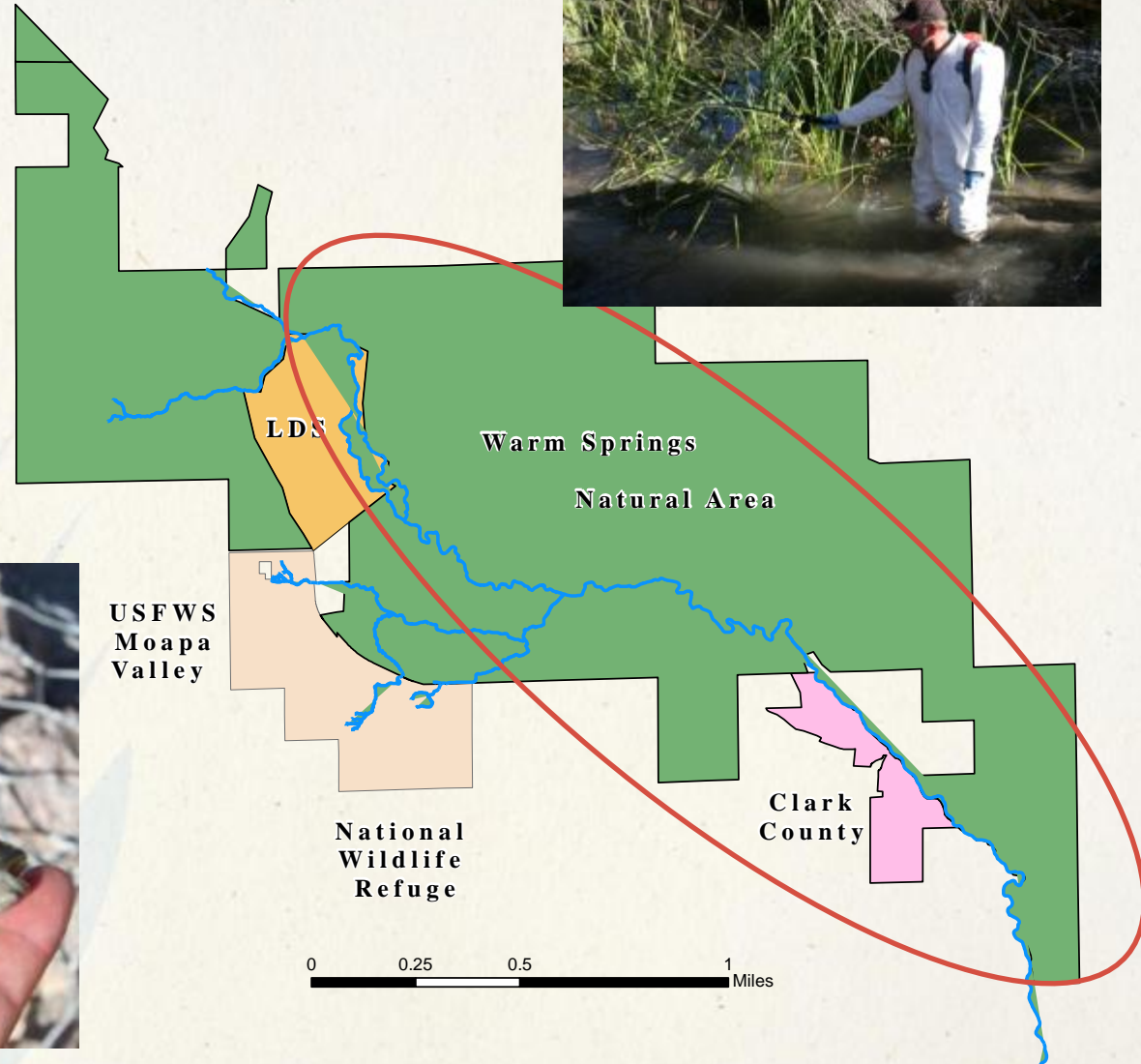
Fish Barriers and Tilapia Control Efforts

- **Nevada Dept. of Wildlife** lead treatment on South Fork in December 2009.
- Rotenone applied with drip systems, and sprayers, and directly to over 80 spring orifices.
- Detoxification using potassium permanganate with sentinel fish in cages downstream



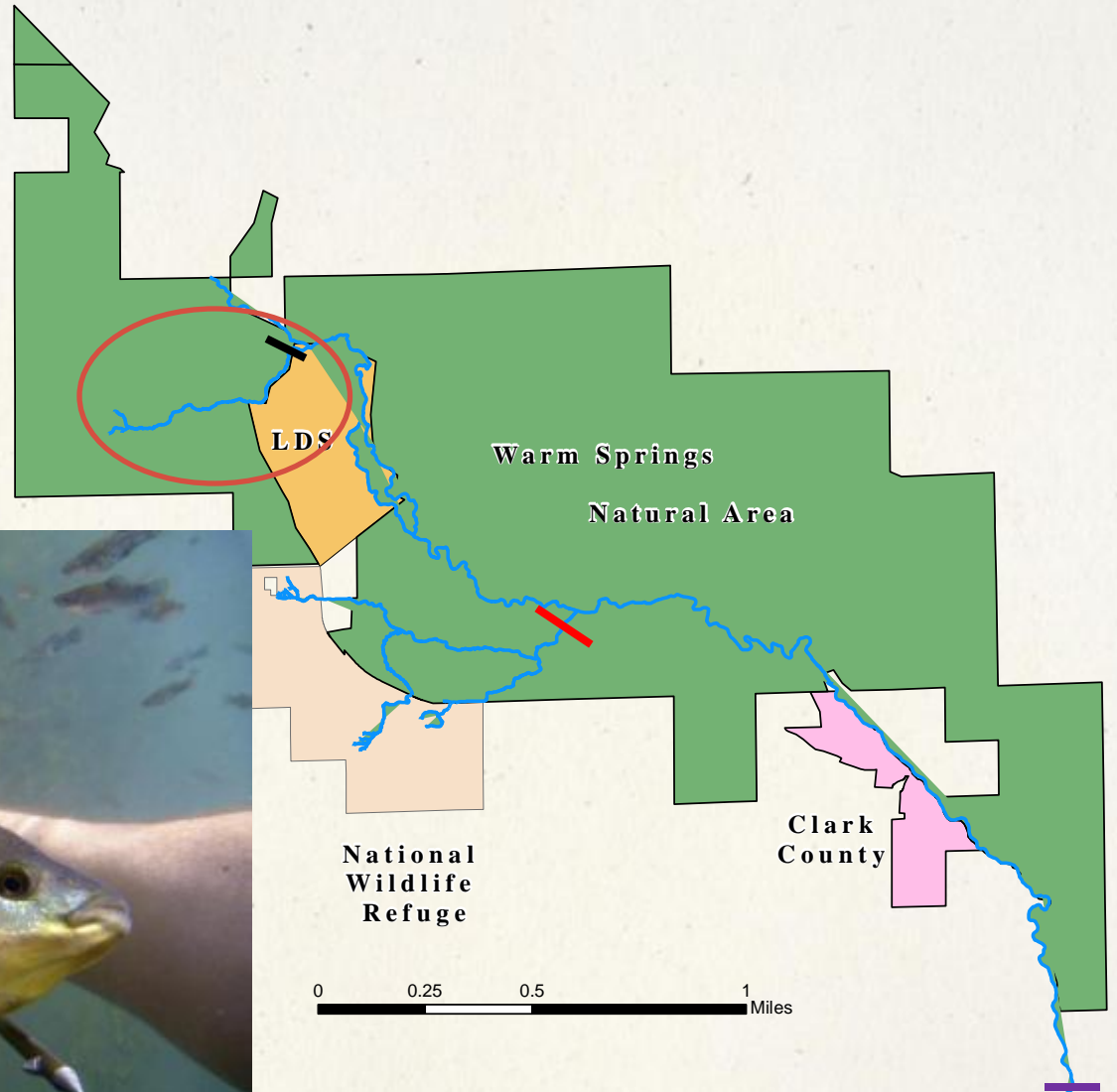
Fish Barriers and Tilapia Control Efforts

- **Nevada Dept. of Wildlife** lead a second rotenone treatment in whole system in late 2010 after fire improved access



Follow up treatments on South Fork in 2011

- Several tilapia found in South Fork Summer 2011
 - NDOW/SNWA immediately start trapping and spearing
 - Another rotenone treatment performed in Fall 2011



NDOW 4 Rotenone Treatments October/November 2011



NDOW and SNWA Closely Monitoring for More Tilapia

- No tilapia found in system-wide snorkel counts in February and August 2012, February and August 2013
- Nor in September 2012, April 2013, September 2013 trapping with BIO-WEST
- But NDOW caught one on the South Fork on September 20, 2012.
- September 3, 2013 flood over the downstream BLM Barrier
- Tilapia eradication critical for Dace Recovery
 - Environmental DNA?
 - Tilapia
 - Red shiner
 - Crayfish
 - ???

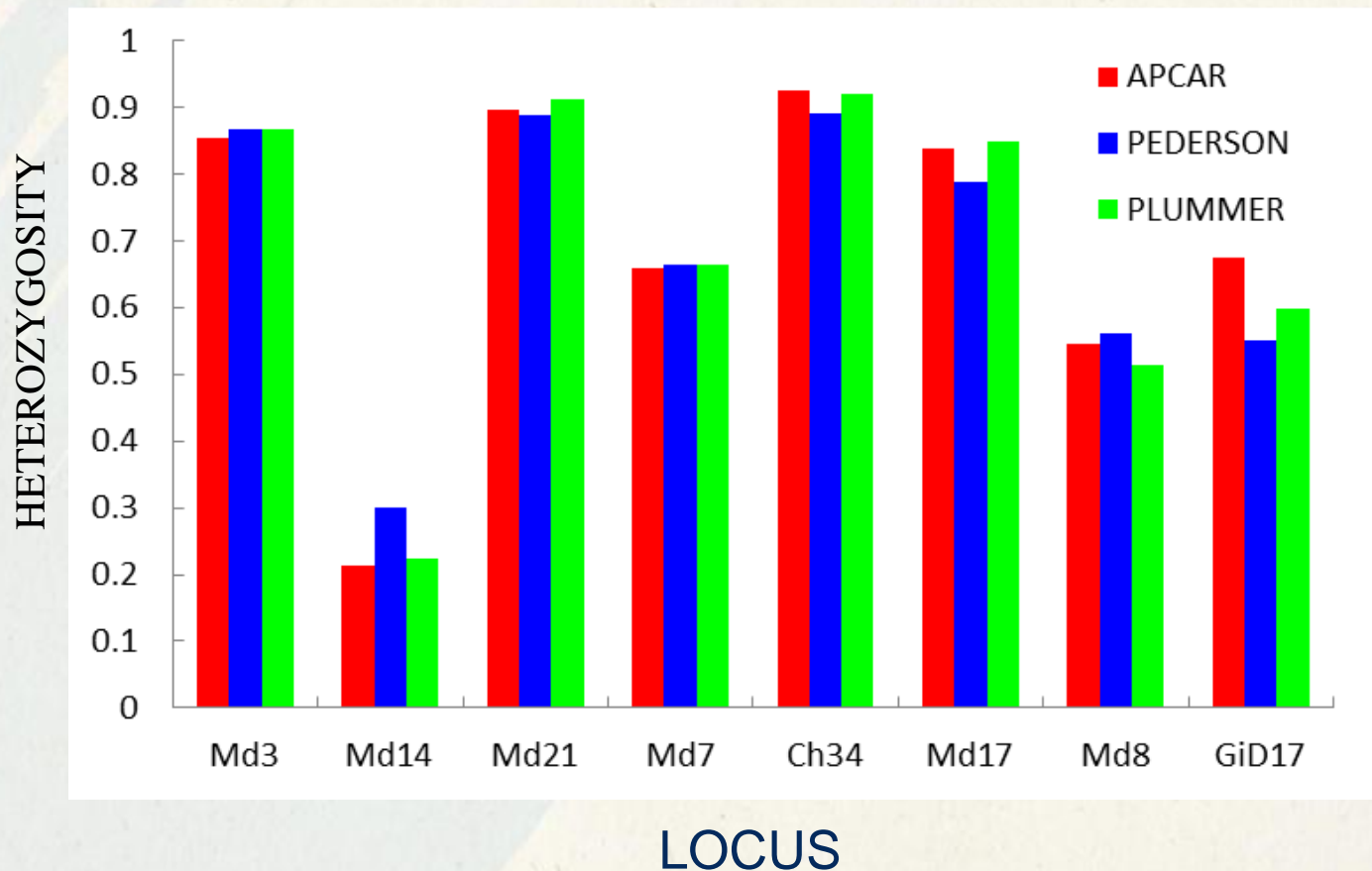


Apcar Culvert Replacement Allows Fish Passage 2013



USGS Research (Hereford 2013)

- Good genetic health; no sign of inbreeding when population dropped to 459 in 2008



Next Steps for Biological Advisory Committee

- Continue efforts to remove tilapia and other invasive species
 - Once tilapia are eliminated, remove fish barriers to restore connectivity
 - Install removable barriers that can be replaced if other invasive fish are found



Next Steps for SNWA

- Continue monitoring Moapa dace population
- Work cooperatively to manage water in the Muddy River
- Finalize Muddy River Recovery Implementation Program which will address other species on the Muddy River
- Provide limited Public Access to Warm Springs Natural Area



Acknowledgements

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