Interdisciplinary Mapping along the Lower Colorado River :

Importance to climate science, habitat restoration, and urban planning in National Wildlife Refuges and other Public Lands

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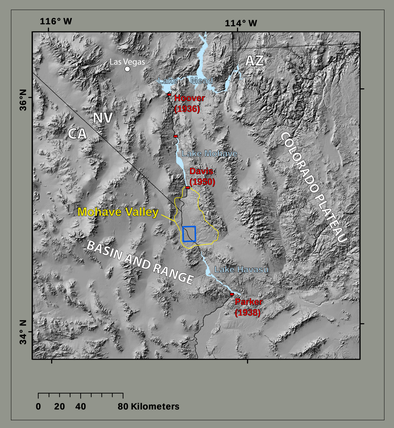
Problem:

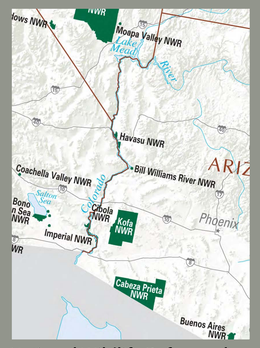
The lower Colorado River valley is a critical but increasingly imperiled resource. The river supplies water to 22 million people and provides critical habitat to many endemic and endangered fish species, as well as migrating birds along the Pacific Flyway. Rapid urban growth, water diversion, recreation, and agriculture compete with national parks, wildlife refuges, tribal lands, and wilderness areas for space and resources.

The Colorado River is the trunk stream draining most of southwestern North America, including areas expected to be particularly sensitive to future climate change. Resources are affected strongly by patterns of development, water consumption, and climate changes within the river and in the upstream watershed. Balancing the demands on the river requires interdisciplinary science about the geologic materials that form the substrate for riparian habitat in the Colorado and other Rivers.

This poster highlights some of the benefits and questions that arisen from interdisciplinary collaborative mapping in the system.

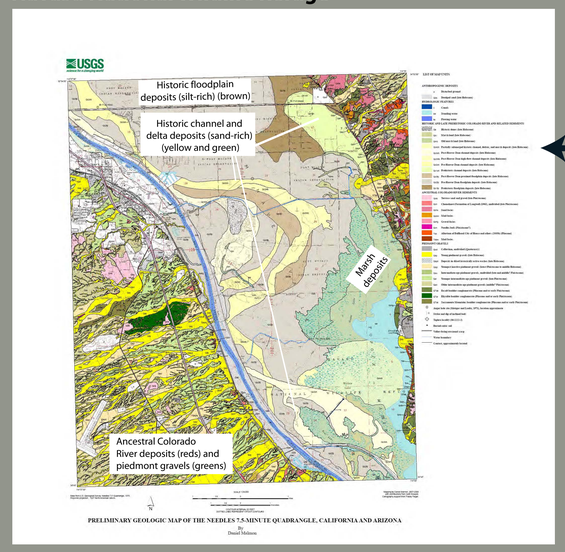
Public Lands and Mapping along along the Colorado River





National Wildlife Refuges along the Lower Colorado River

Example Map Product: Needles 7.5' Quadrangle Havasu National Wildlife Refuge



Management implications of mapping along the Colorado River

1. Geologic record contains history of **landscape and ecosystem response to past climatic changes**

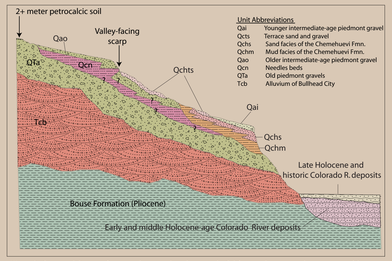
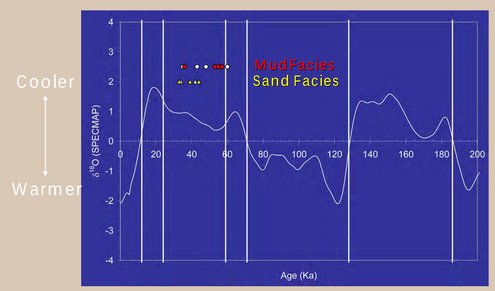


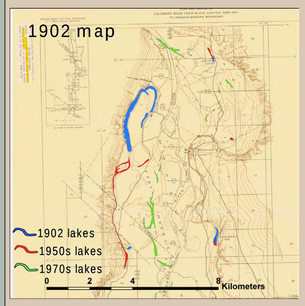
Figure 3. Conceptual diagram of interpreted stratigraphic relations in the California and Arizona piedmont portions of the Needles 7.5' Quadrangle and adjacent areas. Colorado River-dominated sediments are shown in shades of orange and red, and piedmont gravel units are in shades of green. The unexposed Pliocene Bouse Formation and early and middle Holocene river deposits do not crop out in the map area, but these sediments have been identified in drill cores in the Needles 7.5' Quadrangle and in cores and outcrops in the adjacent Topock Quadrangle. Query marks on the upper and lower contacts of the Needles beds are shown to indicate that stratigraphic position and age of that unit are uncertain. (Alt text: Conceptual diagram of interpreted stratigraphic relations in the California and Arizona piedmont portions of the Needles 7.5' Quadrangle and adjacent areas.)

OSL ages from the Chemehuevi Fm

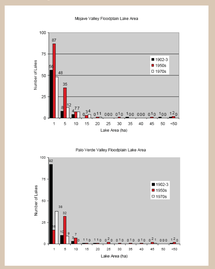


2. Study of past environments provides **baseline information about pre-disturbance conditions**

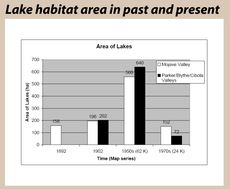
"Backwater Habitat" = Naturally formed floodplain lakes



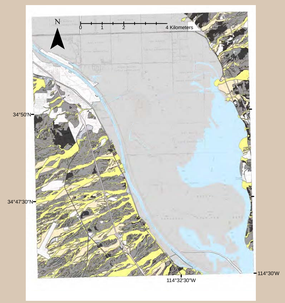
Probability distribution of lake sizes and shapes



Lake habitat area in past and present



3. **Flood hazards** zones can be delineated from geologic maps



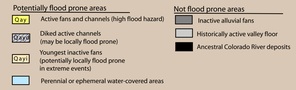
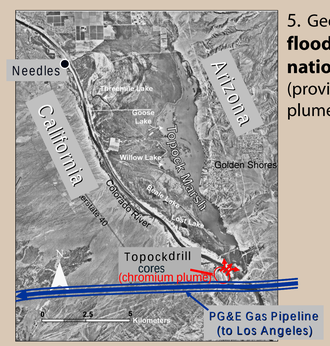


Figure 10. Generalized map of the Needles Quadrangle showing flood prone, potentially flood prone, and non-flood prone areas based on geologic mapping. Map symbols and associated flood hazards are discussed in the report and in the Description of Map Units.

4. Distribution of past environments determines distribution of fine and coarse-grained material in the floodplain, determining **water exchanges with the floodplain**, and **suitability of areas for planting native vegetation**



5. Geologic maps provide guidance for **modeling water exchange with floodplain, and predicting the subsurface movement of contamination**
(providing input on framework subsurface geology for hexavalent Chromium plume near Topock)

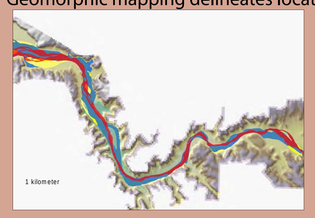
Recent and ongoing surficial mapping

- Current WESP mapping (pub 2008)
- Proposed collaborative mapping w/ state surveys (2009-2011)
- Current NV (House) and AZ (Pearthree) mapping (2008-9?)
- Previous quadrangle maps including surficial geology
- Other previous maps including surficial geology

Interdisciplinary mapping in the Bill Williams River

Largest remaining areas of native riparian forest and associated wildlife in Lower Colorado River region; thus it is of great conservation and mitigation value

Geomorphic mapping delineates location of active channel over time



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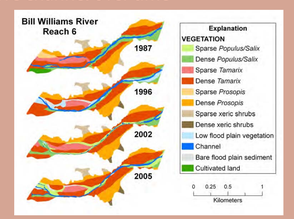
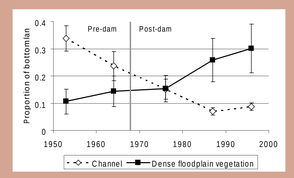
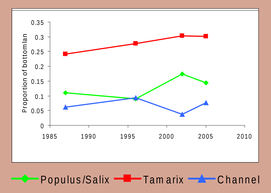


Vegetation mapping shows relation between geology and habitat

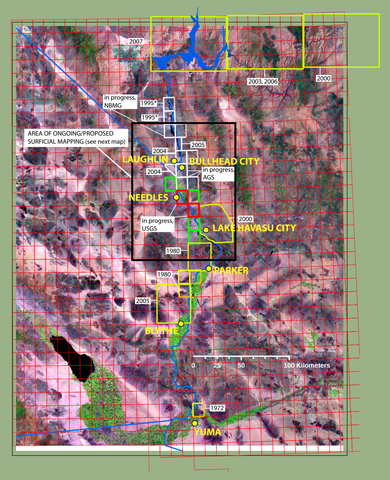


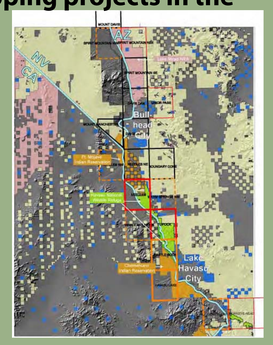
How do land cover changes relate to streamflow?
(Details in Shafroth et al. 2002)



Effects of recruitment on river-scale vegetation dynamics

Past and proposed future geologic mapping projects in the Colorado River area (suggestions from USFWS appreciated)





- National Parks Service
- Tribal Land
- National Wildlife Refuges
- Bureau of Land Management
- State Land

- Ongoing mapping
- Proposed USGS/NBMG/AGS mapping