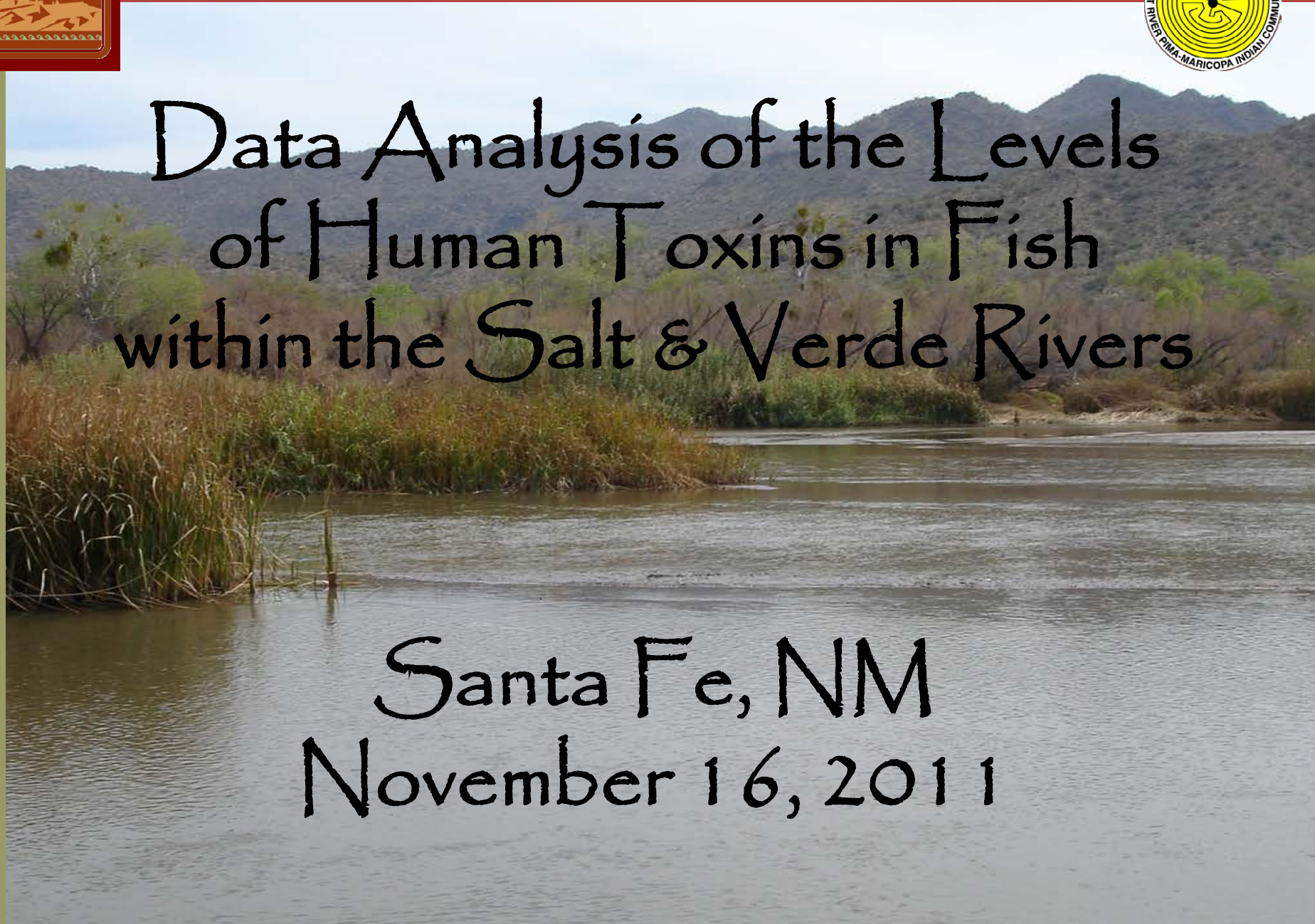
Data Analysis of the Levels of Human Toxins in Fish within the Salt & Verde Rivers

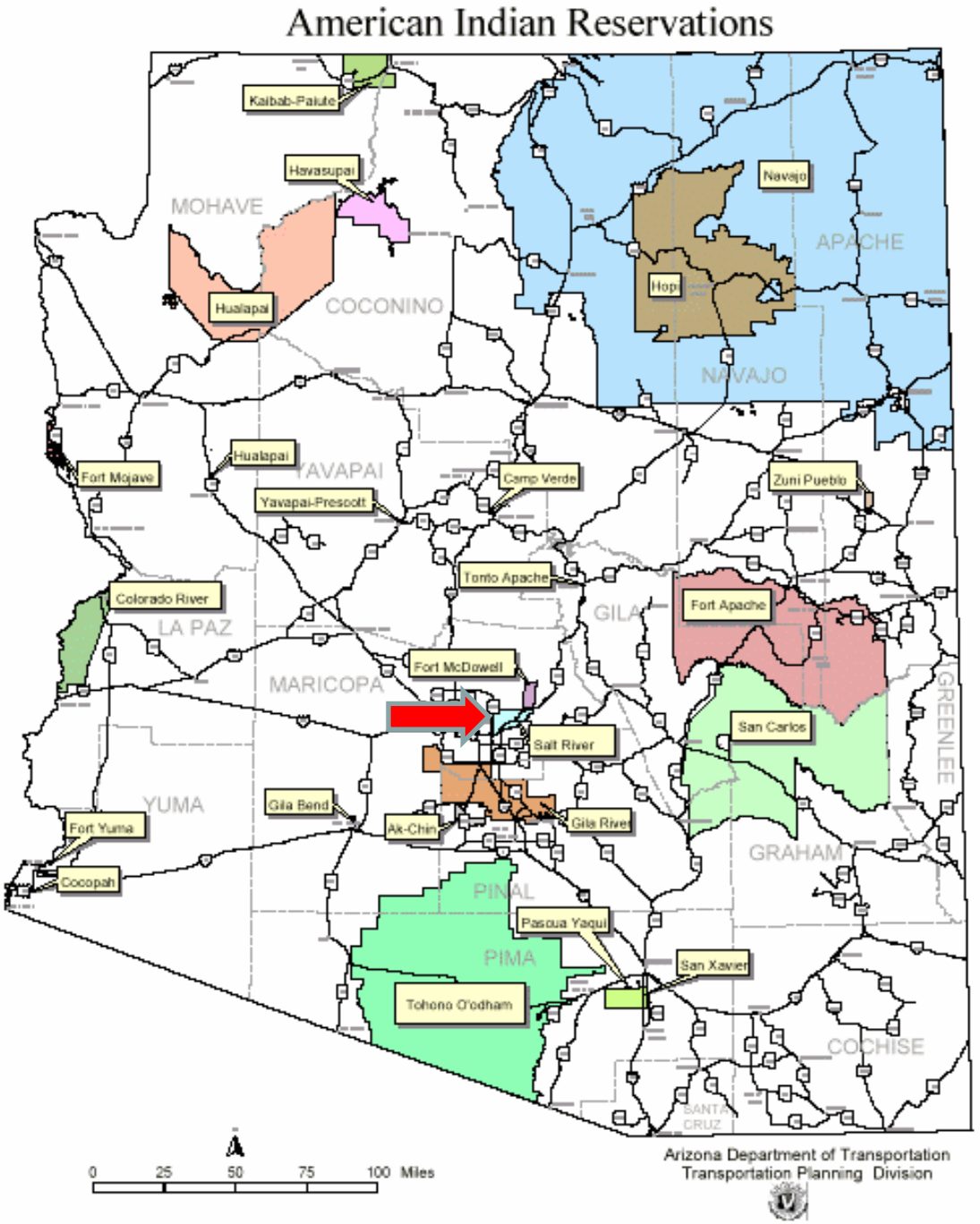


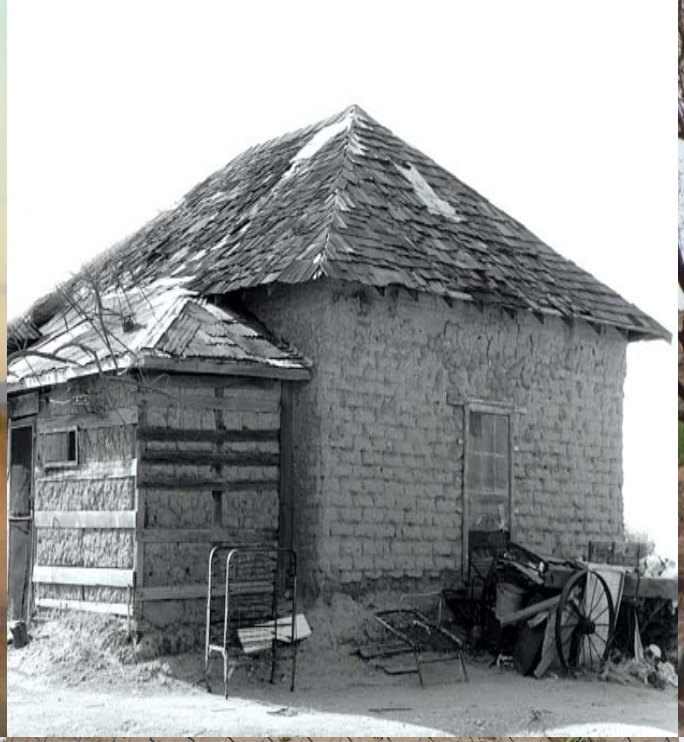
Santa Fe, NM
November 16, 2011

Background Information

- Located 20 miles East of Phoenix
  - Scottsdale, AZ
- Population of 9,500+ Enrolled Members:
  - Akimel O'Odham (Pima)
  - Xalychidom Piipaash (Maricopa)
- Bound on all sides
- Diverse ecosystem
- Innovative tribal commercial development

Community Location





Environmental Protection & Natural Resources

- **Administration**
  - Manager
  - Supervisors
  - Technical Support
- **Air Quality Program (AQP)**
- **Brownfields Program**
- **CARP Program**
- **Environmental Programs & Policy Development (EPPD)**
  - Pesticides & Hazardous Substances
  - Recycling
  - Solid Waste
- **Land Use Compliance (LUC)**
  - Archaeology
  - Enforcement & Compliance
  - National Environmental Policy Act (NEPA)
  - Stormwater
- **Range Management Program (RMP)**
- **Water Quality Program (WQP)**
  - **Ground & Surface Water**
  - **Wetland Program**

Water Quality Issues

- Surface Water
- Ground Water
- Wetlands

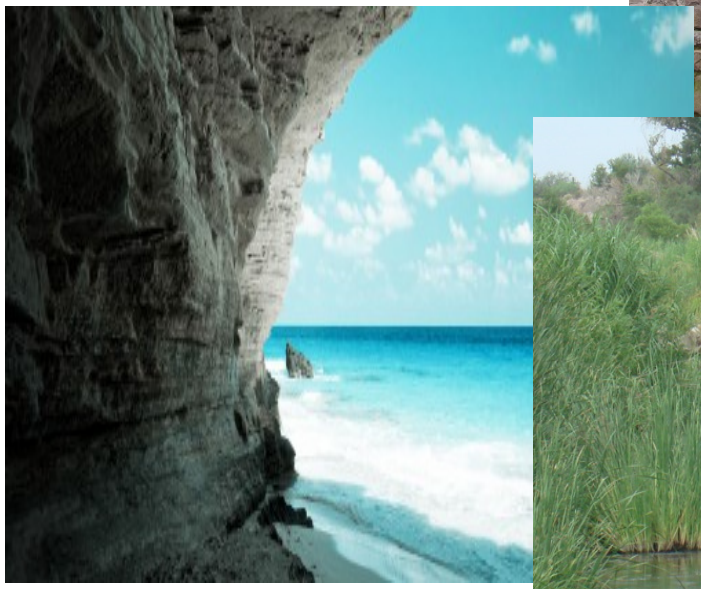
Grants & Additional Funding

- CWA §319 Base
- CWA §319 Competitive
- CWA §106
- Wetland Development Program
- SRP-MIC

Project Background

4 Sampling Sites

- "The Beach"
- "The Wall"
- Pond #1
- Pond #2



"The Beach"

- Verde River
- Between Pole 1 and 2
- Beach-like area with a large eddy

"The Wall"

- Salt River
- Above Granite Reef Dam
- High Potential for Variability in
- Fish Species

Pond #1

- Salt River
- Directly below flood gates of dam
- Water extremely turbid
- High algal growth
- Depth only 3-8ft

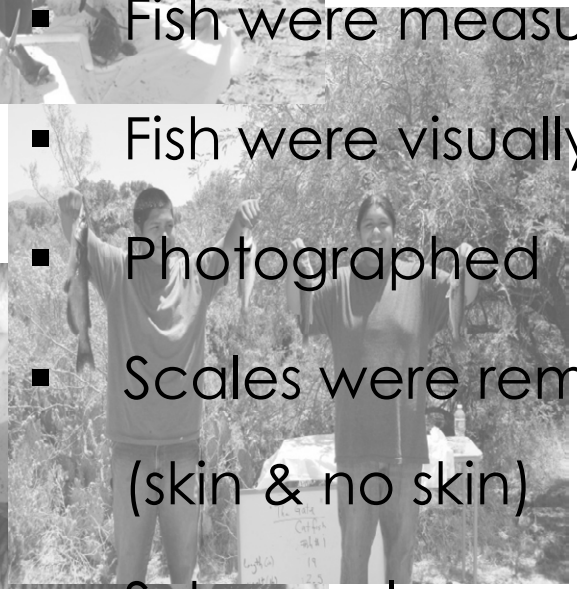
Pond #2

- Salt River
- Downstream of Granite Reef Dam near Bush Highway
- Flows received through drainage pipe

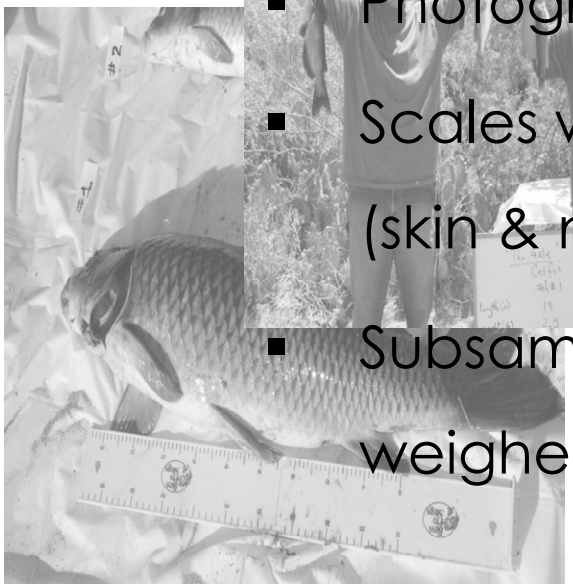
Sampling Methods

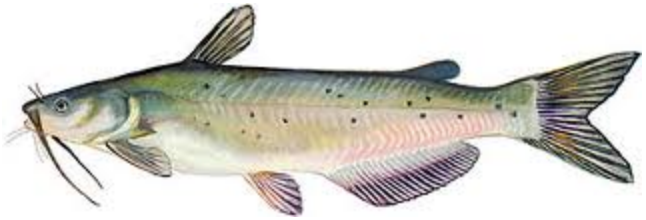
Fish Species Harvested

Fish Tissue Processing



- Fish were weighed individually
- Fish were measured
- Fish were visually inspected for lesions
- Photographed
- Scales were removed and fish filleted (skin & no skin)
- Subsamples wrapped in foil and weighed





Composite Scale

Fish Species

Large

Small

Skin

Skinless

Skin

Skinless

Toxins Analyzed

Carcinogens

Total Inorganic Arsenic
Aldrin
Gamma-BHC (Lindane)
Chlordane
DDD/DDE/DDT
Dieldrin
Heptachlor/epoxide
Hexachlorobenzene
Toxaphene
PCBs (total)
PAHs
2,3,7,8-TCDD (dioxin)
TEQs*

Non-carcinogens

Alpha/Beta-BHC
Selenium
Cadmium
Methylmercury
Tributylin
Endosulfan sulfate
Endosulfan I+II
Endrin/aldehyde/ketone
Mirex
Methoxychlor
Chlorpyrifos

*Estimated Total Toxicity Equivalency Quotient based on substituted dioxins and furans
RED – Detected in all fish species
GREEN – Detected in some fish species

Formula

Generation of the Maximum Monthly Fish Consumption Limit, CR_m (meals/month)

Non-carcinogenic Effects:

$$CR = \Sigma_{m=1} (RfD_m / C_m) * BW$$

$$CR_m = (CR * T)/MS$$

$$CR = RL * BW / \Sigma_{m=1} (C_m + CSF_m)$$

Carcinogenic Effects:

$$CR = RL * BW / \Sigma_{m=1} (C_m + CSF_m)$$

$$CR_m = (CR * T)/MS$$

CR = maximum allowable fish consumption rate (g/kg)
RfD = Oral Reference Dose (mg/kg-d)
BW = consumer body weight (70 kg)
C = concentration of a human toxin in fish tissue (mg/kg)
T = time average period (1 month = 30.44 d)
MS = meal size of uncooked fish fillet (0.227 kg/meal)
RL = maximum acceptable life risk level (10^{-5})
CFS = Cancer Slope Factor $((mg/kg\text{-}d)^{-1})$

Maximum Monthly Fish Consumption Limit (CR_m)

Fish Species	CR_m*	Toxin Association
Channel Catfish	4.01 (4)	Methylmercury
Glass Carp	6.06 (6)	Methylmercury
Largemouth Bass	3.83 (4)	Methylmercury
Rainbow Trout	8.47 (8)	As + (DDD+DDE+DDT)
Sunfish	8.27 (8)	As + (DDD+DDE+DDT)
Bluegill	8.43 (8)	As + (DDD+DDE+DDT)

**Associated with a consumer body weight of 70 kg (154 lbs) and a meal size of 0.227 kg (8 oz) of uncooked fish fillet*

Results

- Maximum Monthly Fish Consumption Limits for a selected set of fish species harvested from the Community's surface bodies were generated using the approach and assumptions recommended by USEPA. The results of these will be used to issue Fish Consumption Advisories for Community Members in the near future.
- The bio-accumulation of methylmercury by Channel Catfish and Largemouth Bass harvested from the Community's surface water bodies was found to be up to 5 times lower than the corresponding results of a Roosevelt Lake Study conducted by the State of Arizona.
- Within a fish species, it appears that larger/older fish generally tends to accumulate a higher level of human toxins that smaller/younger fish.
- Within a fish species, tissue samples with intact skin generally tend to accumulate a higher level of human toxins than skinless sample.
- Instead of testing an entire spectrum of human toxins, inorganic arsenic, methylmercury, and DDD+DDE+DDT can be used as indicator toxins when conducting future risk assessment on bio-accumulation of human toxins in fish from the Community's surface water bodies.

Next Steps

- Fish Consumption Advisories
- Outreach

Water Quality Website

http://www.srpmic-nsn.gov/government/epnr/waterquality.asp

SALT RIVER PIMA-MARICOPA INDIAN COMMUNITY

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EPNR

- Air Quality
- Water Quality
- Land Use Compliance
- Waste Management
- Range Management
- Clean and Green Campaign
- Earth Day
- EPNR in the News
- Administration
- Documents
- Contact

WQ Home | Map | Monitoring | Wetlands | Education

Water Quality Program

What We Do

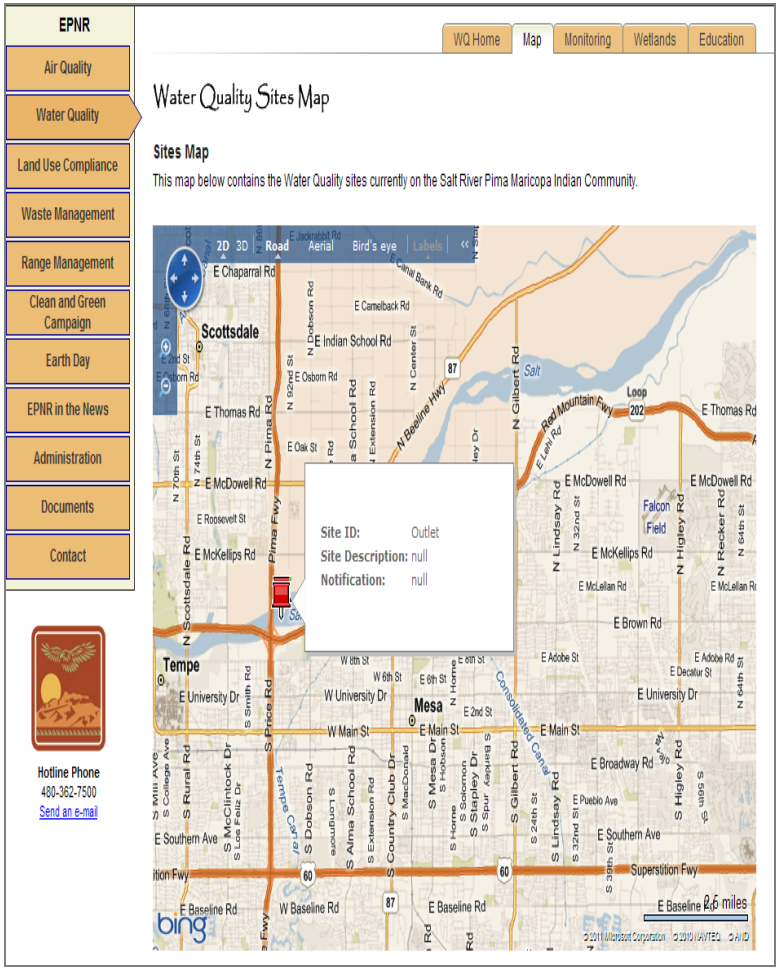
The Water Quality Program (WQP) has overall responsibility for ensuring the waters within the Community are in compliance with water quality standards, which were updated for the SRPMIC during this year. The program enforces SRPMIC and federal regulations to protect water quality.

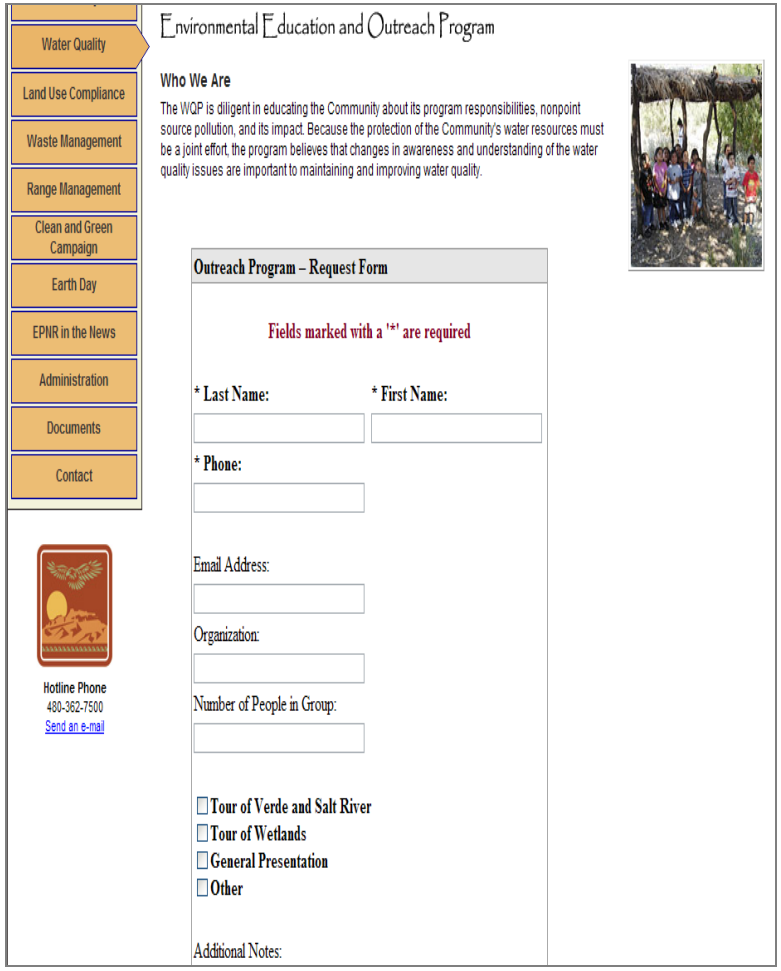
The WQP collects and analyzes monitoring data to ensure the quality and safety of surface and groundwater. This data is used to create annual reports, which inform the Community of the surface and groundwater quality. Additionally, the WQP performs educational outreach to other departments, Community schools, and Community members to increase awareness of the importance of environmental stewardship and the Community's watershed. In addition to protecting the Community's surface and groundwater, the WQP manages the Community's wetlands to mitigate nonpoint source issues.

Document development plays an integral part of ensuring the water quality is improved, protected, and maintained. These documents may also provide a tool to share data with the Community and federal government. The WQP develops and updates documents to reflect current federal standards and guidelines as well as consideration of any SRPMIC cultural practices. Most documents are revised every 2-5 years, or as needed.

Hotline Phone
480-362-7500
Send an e-mail

Map & Outreach Form





Contact Information

EPNR Hotline (480) 362-7500

www.SaltRiverEnvironmental.org