

Charting the Health of the Upper Santa Cruz River

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*“Running water is something
for a Southwesterner to get
excited about.*

*It’s scarce, it’s cool, it’s wet,
and it creates an oasis of
shade, a green retreat from
the sun and desiccation of the
surrounding country.”*

Going Back to Bisbee
Richard Shelton

Riparian Areas



- Less than 2% of land in the southwest
- Provide valuable ecosystem services

Santa Cruz River Health Assessment

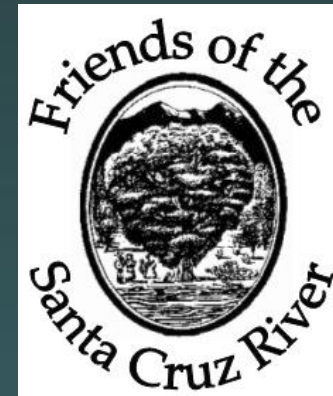
How do we know if the river is 'healthy'?



- Regular Monitoring
- Living River Report

Many groups conducting monitoring and research

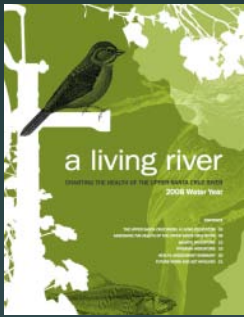
Arizona Department of Environmental Quality
Arizona Department of Water Resources
Arizona Game and Fish Department
Arizona State Parks
Arizona State University
Friends of the Santa Cruz River
Nogales International Wastewater Treatment Plant
Sky Island Alliance
Sonoran Institute
The Nature Conservancy
Tucson Audubon Society
University of Arizona
University of Sonora
U. S. Geological Survey
U. S. National Park Service at Tumacácori NHP
U. S. National Park Service, Sonoran Desert Network



Sonoran Institute Monitoring

- Initiated May 2009
- Regional monitoring
 - NPS Sonoran Desert Network methods
- Randomly selected sites
- Quarterly monitoring
 - Water quality, photo points
- Annual monitoring
 - Aquatic invertebrates, channel morphology, riparian vegetation



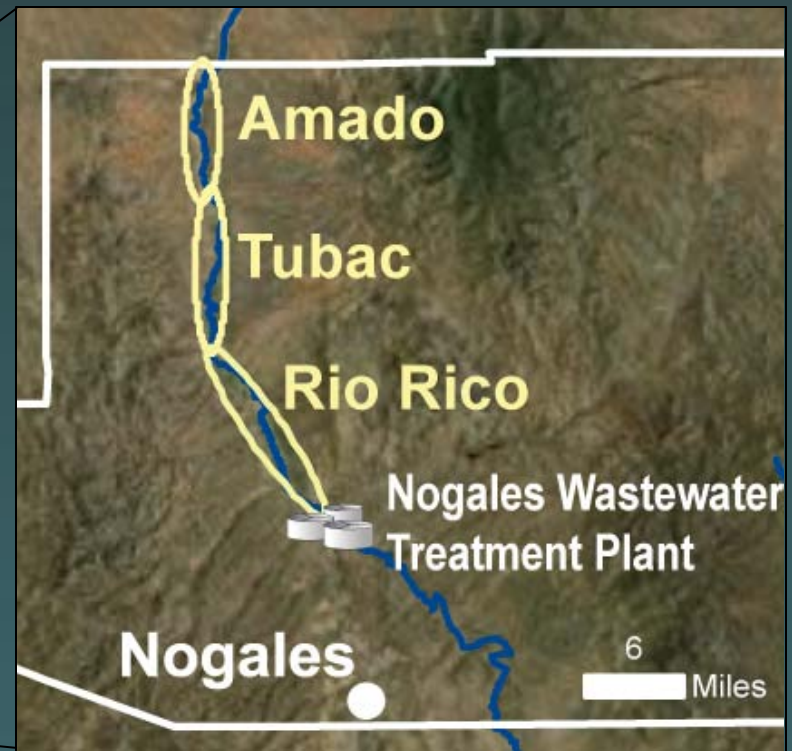
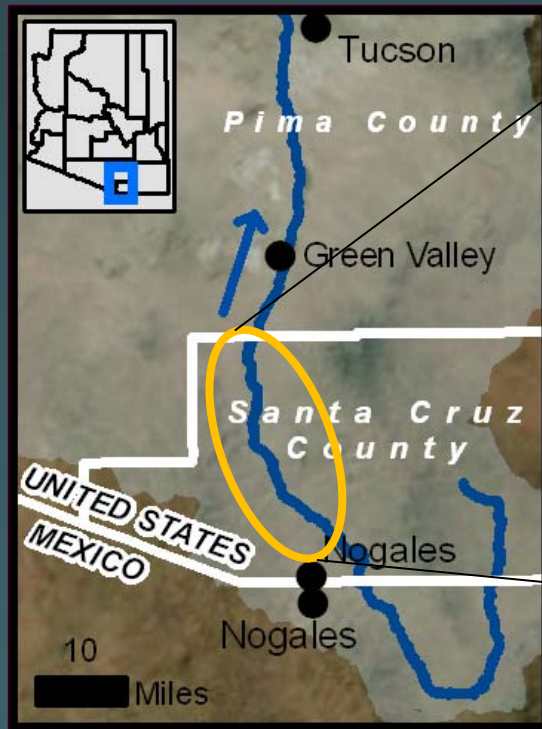


Living River Report

- Assessment of 10 indicators
 - Aquatic and Riparian
- Data compared to standards
 - Summary - percent of the data that meets the standard
- Annual summary – water year
 - October 1, 2007 – September 30, 2008
- Summarized by basin



Sub-area Basins in the Upper Santa Cruz River





Living River Report

Aquatic Indicators

Indicators and Standards

Standard Source and Type



Dissolved Oxygen: > 1 mg/L

ADEQ: wildlife in effluent



Ammonia: varies w/ temperature and pH

ADEQ: wildlife in effluent



Total phosphorous: < 5 mg/L

Historic (1992-1999 median)



E. coli: < 235 CFU/100 mL

ADEQ: human health



Metals: varies by specific metal

ADEQ: wildlife



Aquatic Invertebrates: 2008 baseline

Baseline information



Fish: 2008 baseline

Baseline information



2008 Water Year -- Aquatic Results

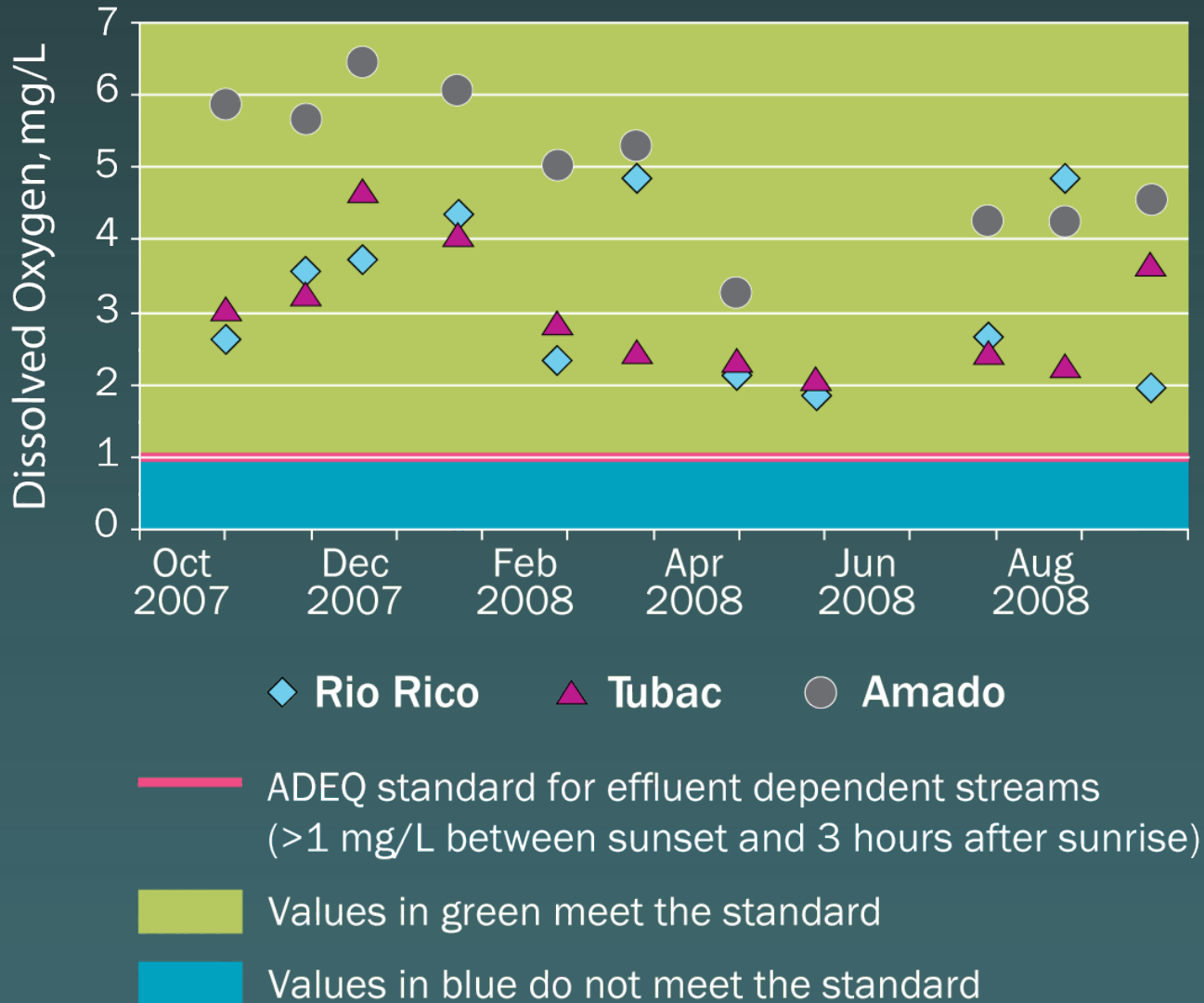
Indicators and Standards

% Attainment of Standard

		Rio Rico	Tubac	Amado
 	Dissolved Oxygen: > 1 mg/L	100%	100%	100%
 	Ammonia: varies w/ temperature and pH	0%	0%	no data
	Total phosphorous: < 5 mg/L	25%	25%	no data
 	E. coli: < 235 CFU/100 mL	66%	34%	33%
	Metals: varies by specific metal	95%	no data	no data
	Aquatic Invertebrates: 2008 baseline	no data	baseline	no data
	Fish: 2008 baseline	baseline	baseline	baseline

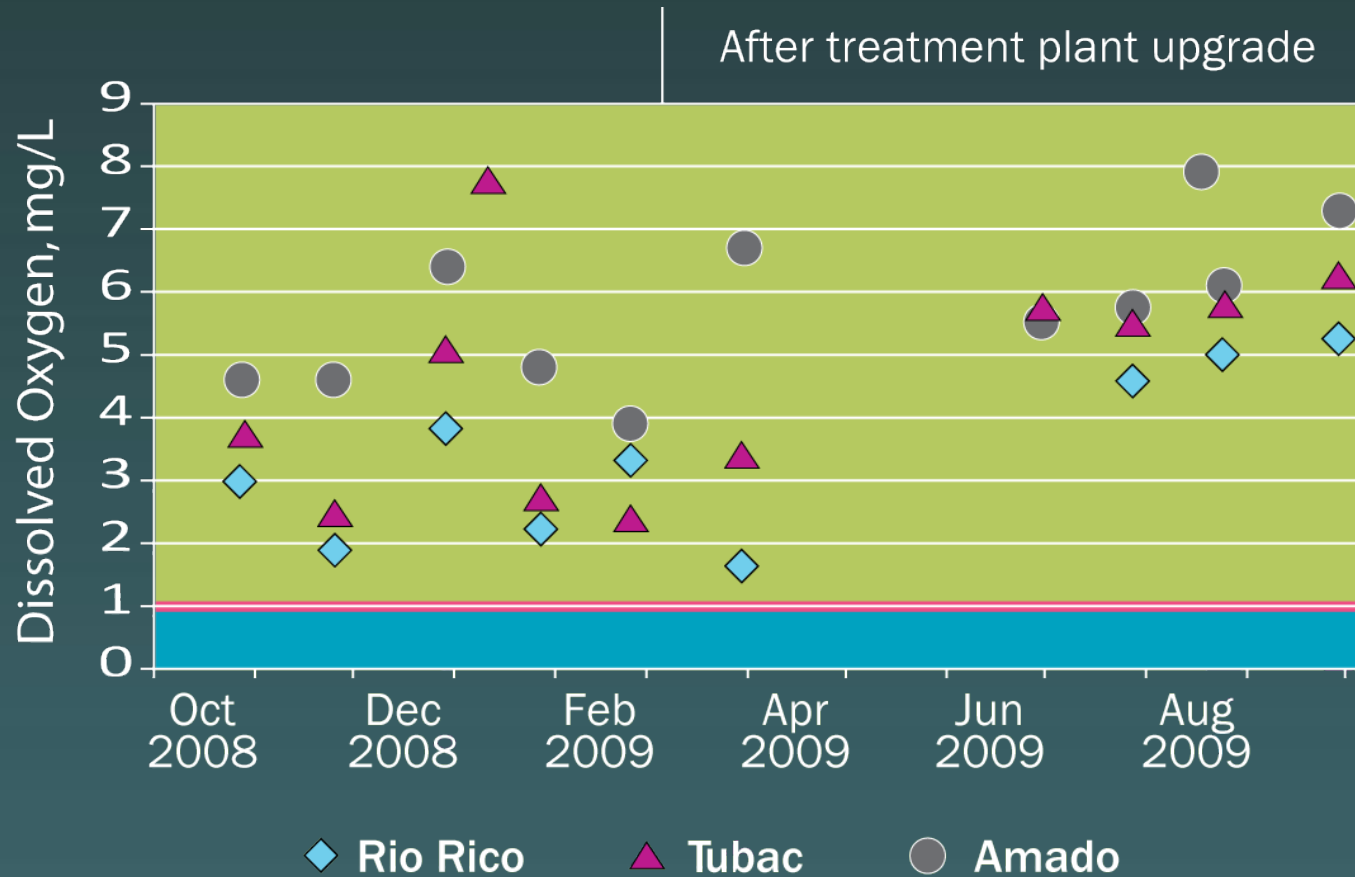


2008 - Dissolved Oxygen Meets Standard





2009 - Dissolved Oxygen Increases



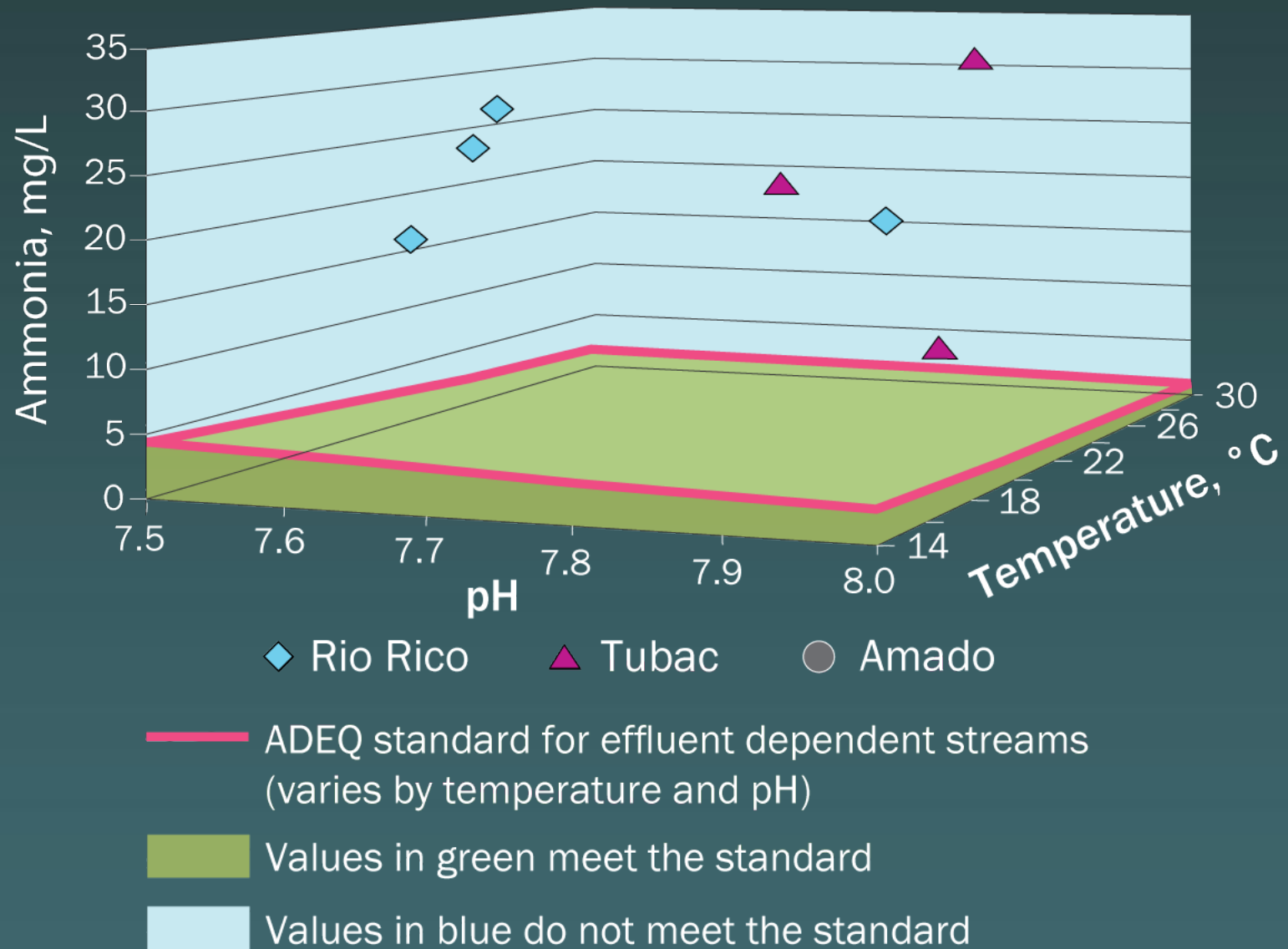
— ADEQ standard for effluent dependent streams
(>1 mg/L between sunset and 3 hours after sunrise)

Values in green meet the standard

Values in blue do not meet the standard



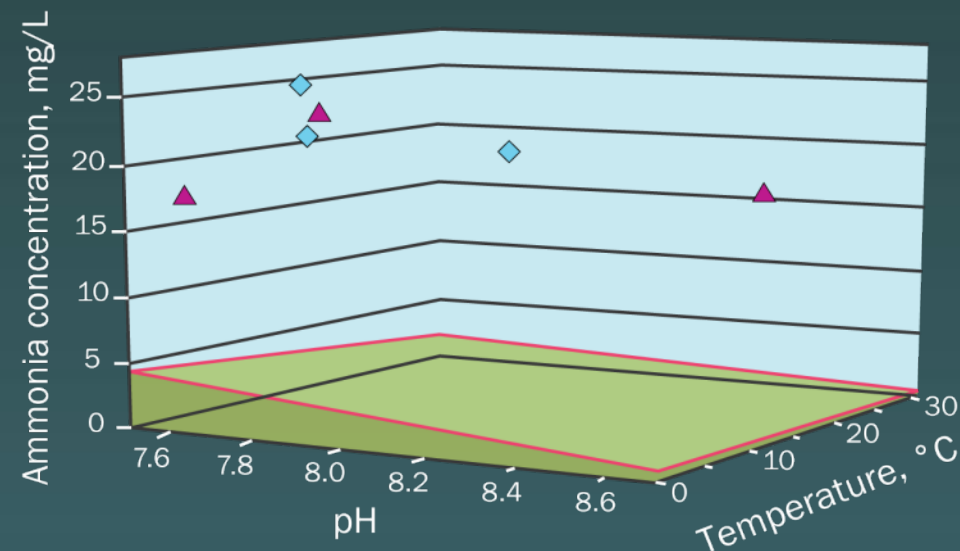
2008 - Ammonia does not meet Standard



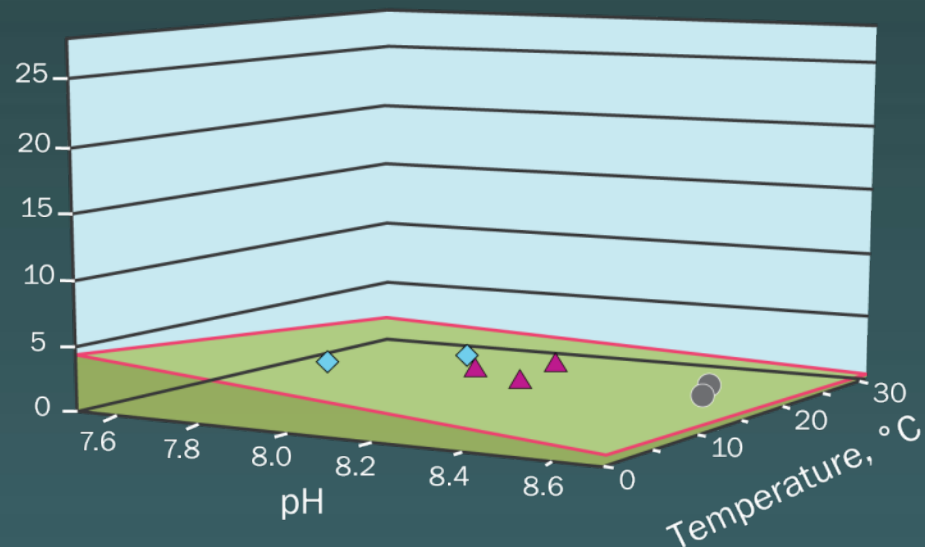


2009 - Ammonia Levels Decrease

Before Treatment Plant Upgrade



After Treatment Plant Upgrade



◆ Rio Rico ▲ Tubac ● Amado

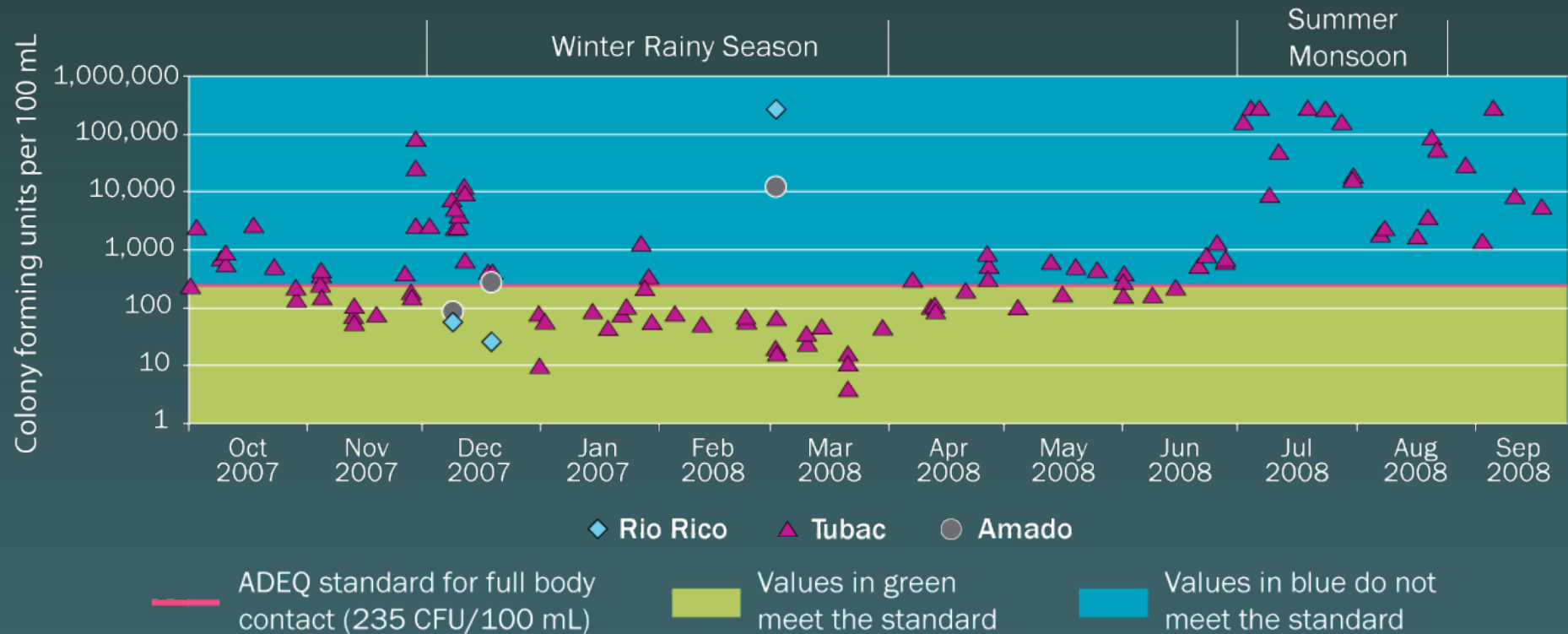
— ADEQ standard for effluent dependent streams
(varies by temperature and pH)

■ Values in green meet the standard

■ Values in blue do not meet the standard

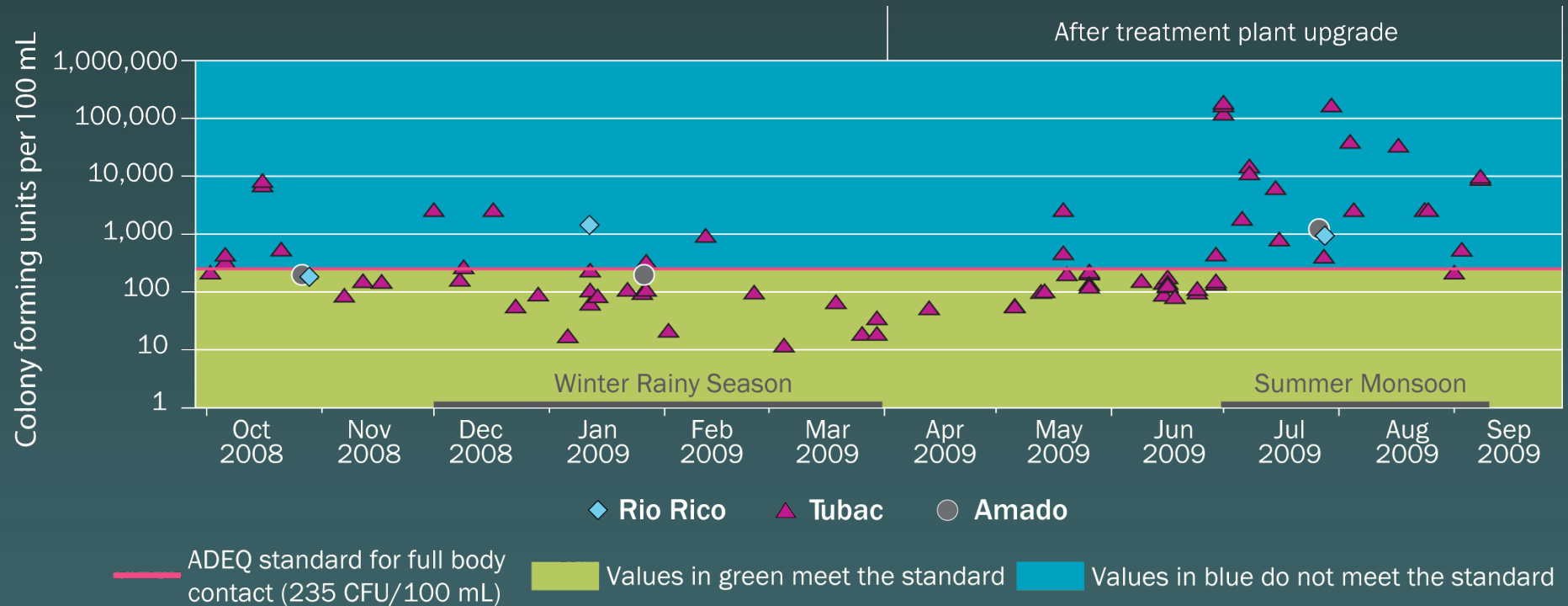


2008 - E. Coli Levels Vary With Season





2009 - E. Coli Levels Vary With Season





Living River Report

Riparian Indicators

Indicators and Standards

Standard Source and Type



Depth to groundwater: <5.1m

Scientific standard



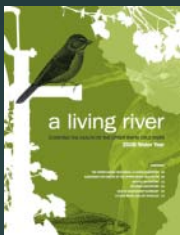
Groundwater variability: < 0.8 m/yr

Scientific standard



Riparian vegetation: 2006 baseline

Baseline Information



2008 Water Year – Riparian Results

Indicators and Standards

% Attainment of Standard

Rio Rico Tubac Amado



Depth to groundwater: <5.1m

86% 100% 0%



Groundwater variability: < 0.8 m/yr

100% 100% 100%



Riparian vegetation: 2006 baseline

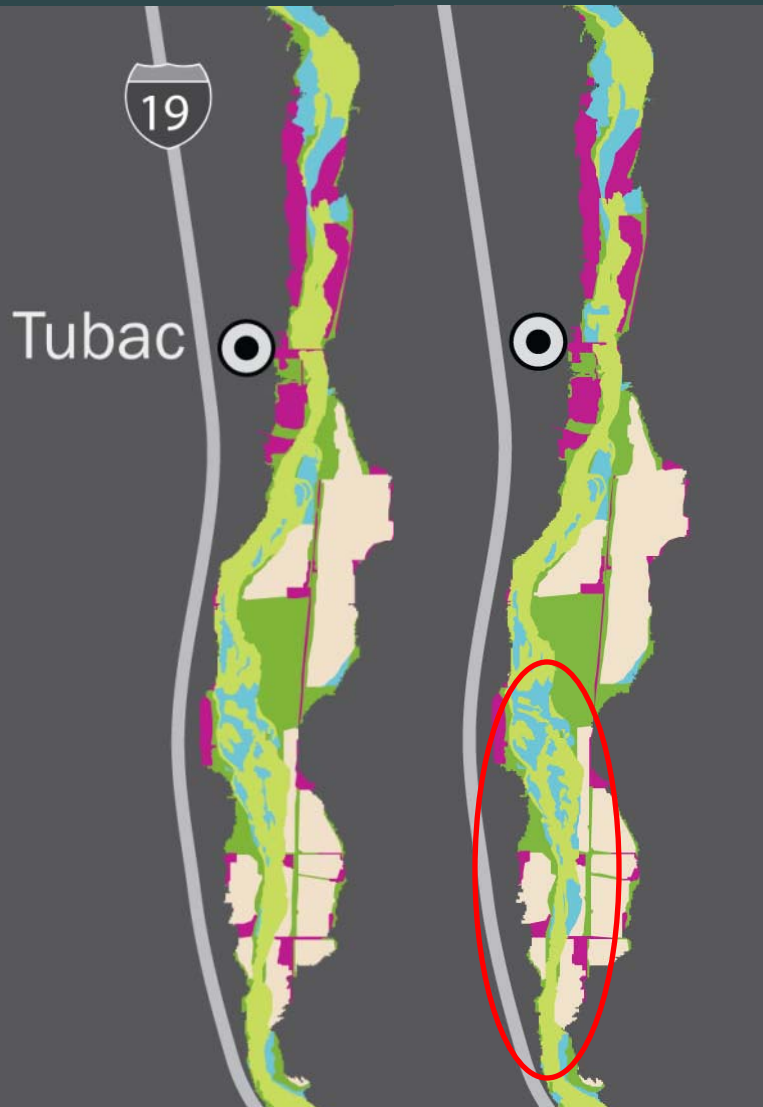
baseline baseline baseline



Riparian Vegetation in Tubac

2006

2009



Percent of floodplain 2006

0% 10% 20% 30% 40% 50% 60%

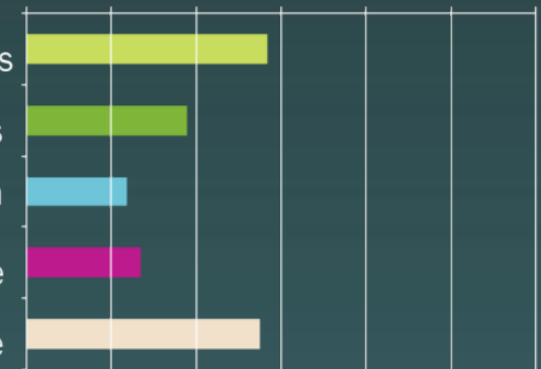
Cottonwood Forests & Woodlands

Mesquite Forests & Woodlands

Other Vegetation

Human Infrastructure

Agriculture & Pasture



Percent of floodplain 2009

0% 10% 20% 30% 40% 50% 60%

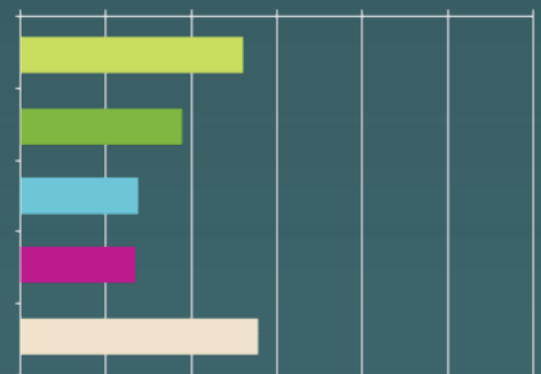
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Conclusions

- Regular monitoring helps track change
- Scientific Baseline
- 2008 Aquatic indicators - poor water quality for wildlife
- 2008 Riparian indicators - good for cottonwood and willows
- Snapshot in time
 - Treatment plant upgrade
 - 2009 Living River – Stay Tuned!



Special Thanks To:

- Scientific Advisory Committee
- Those conducting monitoring and research on the Santa Cruz River
 - Arizona Department of Environmental Quality
 - Arizona Department of Water Resources
 - Arizona Game and Fish Department
 - Arizona State Parks
 - Arizona State University
 - Friends of the Santa Cruz River
 - National Park Service at Tumacácori NHP
 - National Park Service, Sonoran Desert Network
 - Nogales International Wastewater Treatment Plant
 - Sky Island Alliance
 - The Nature Conservancy
 - Tucson Audubon Society
 - University of Arizona
 - University of Sonora
 - U. S. Geological Survey

Read the complete
Living River – 2008 Water Year
report at:

www.sonoraninstitute.org

