

**Kevin Kehl
Biology Teacher**

**What Lies Beneath:
Video Monitoring
of Native Fishes**

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Summary Statement

Palo Verde High School (PVHS) is a city school with little native habitat close enough for students to visit and interact with during school hours. Realizing this, students and faculty constructed a wetland habitat that is representative of those wetlands once commonly found throughout the Santa Cruz River Basin, in which the city of Tucson lies. Now nearly three years later, the wetland, named Tierra Mojada Environmental Research Center or TMERC, teems with native flora and fauna. Of particular interest are the native fishes, which were obtained by permit through the Arizona Game and Fish Department. Four species now reside in the 16,000-gallon habitat-- longfin dace (*Agosia chrysogaster*), Gila chub (*Gila intermedia*), desert pupfish (*Cyprinodon macularius macularius*), and Gila topminnow (*Poeciliopsis occidentalis occidentalis*). The latter two species are both federally listed endangered species, their dwindling populations due to loss of suitable habitat and competition with non-native species. Not only is TMERC a holding facility for these fish, but the wetland is also a designated refugium ready to support other populations in the near future.

Surveying fish populations can be difficult even for the most adept aquatic biologist. For high school students, traditional survey methods are nearly impossible due to the complex nature of the procedures and the risk of undue stress to the fish. However, it is possible to gain an estimate of fish activity and numbers using underwater video equipment. Taken and archived at regular intervals, video and still clips will yield significant data. Posting these graphics along with conservation information on the TMERC web site and uploading video-survey data would allow students and other interested parties to become more familiar with these species and gain a greater appreciation for Arizona's native desert fishes.

The scope of this project is relevant to the North American Native Fishes Association Mission Statement in the following areas:

- ~ It will "promote and disseminate knowledge about North America's native fishes and their habitats..." (NANFA Objective, point one)
- ~ It seeks "to advance the captive husbandry of North America's native fishes for the educational, scientific, and conservation benefits it affords..." (NANFA Objective, point three)
- ~ It will assist in "providing a forum for fellowship and camaraderie among individuals who share a common interest in the diversity, biology, captive husbandry, and conservation of North America's native fishes." (NANFA Objective, point five)

In particular, the statement in the education section of point three--acquaints people with organisms they might otherwise never see alive or know existed, and affords people an opportunity to witness and appreciate their behaviors (feeding, breeding parental care, etc.)--is the ultimate goal of this project. It is agreed that "such acquaintance is a vital step in fostering environmental awareness and promoting a conservation ethic". [These objectives and quotations were taken from the NANFA web site, www.nanfa.org, June 14, 2001.]

Educational Objectives

The overriding theme of this project is a greater awareness of Arizona's decreasing native fish population. Prior to the set up of the equipment, students will investigate the historical populations of the four native fishes and compare them to the current populations. Students will also conduct library and Internet research on the fish species, writing informational articles to be added to the TMERC web site. They will then set up the video equipment and software and begin collecting, archiving and analyzing data. The activities encompassed by this project are in alignment with Tucson Unified School District science standards (2001).

- > SCI-P1: Propose solutions to practical and theoretical problems by synthesizing and evaluating information gained from scientific investigations.
- > SCI-P6: Identify and define a researchable question, conduct the experiment, collect and analyze data, share and discuss findings.
- > SC3-P1: Apply scientific thought processes and procedures to personal and social issues.
- > SC3-P4: Identify and describe the basic processes of the natural ecosystems and how these processes affect, and are affected by humans.
- > SC3-P5: Describe and explain factors that affect population size and growth (e.g., birth and death rates, quality of environment, disease, education).
- > SC4-P6: Describe and explain how the environment can affect the number of species and the diversity of species in an environment.

The wording of these district standards is identical to the Arizona Board of Education standards (1998) though the reference numbers differ slightly. Of course, the Arizona standards are based on those set forth by the National Committee on Science Education Standards and Assessment (1996).

This video monitoring project is also aligned with the Gila topminnow downlisting criteria (Weedman, 1998). Namely:

- > Task 3.1: Develop and implement standardized population and habitat monitoring protocol.
- > Task 3.2: Maintain a population and habitat database and generate annual reports.
- > Task 5: Study life history, genetics, ecology, and habitat of Gila topminnow and interactions with non-native aquatic species.
- > Task 6: Inform and educate the public and resource managers.

In addition, this project is aligned with the desert pupfish downlisting criteria proposed by Marsh and Sada (1993).

- > Task 5: Monitor and maintain natural, re-established and refugium populations.
- > Task 7: Information and education.

Target Audiences

The video monitoring project will initially target approximately 100 biology students at PVHS. These will be the students involved in the set up of the equipment and writing of the web-based information. However the project will have a much farther-reaching impact. In conjunction with the educational outreach done through TMERC, elementary and middle school students as well as other high school students will be able to access the video and numerical survey data via the TMERC web site. Students enrolled in PVHS's Biological Research Methods course will conduct research and statistical analyses on the findings.

Finally, the public at large will be able to see four species of native Arizona fish including the two endangered species. They will be able to identify the species *in vitro*, and hopefully this will allow them to identify them *in vivo*. It is the desire the authors that this will increase awareness of these species and their plight.

Detailed Description

In 1999, PVHS dedicated its 16,000-gallon wetland constructed by students and faculty and with the generous help of community members and businesses. This facility, named Tierra Mojada Environmental Research Center (TMERC), is home to flora and fauna native to the Santa Cruz River basin in southern Arizona. All plants and fish were collected with permission from Cienega Creek, an intermittent stream fed by springs and snowmelt. It is these fish that are the focus of the video-monitoring project.

A durable underwater video camera will be purchased from Supercircuits, Inc. This camera was chosen for versatility and its ability to capture images in very low light conditions such as those at dawn, dusk or on overcast days. This camera will be placed in the TMERC wetland. It will take some experimentation to find the optimal location and depth for the placement of the camera. It is possible that there will be two or three sites where the camera can be mounted.

The wetland exists in a relatively secure location behind a wrought iron fence and surrounded by school buildings. However, it will be necessary to secure the camera. A design for a secure mounting system will be developed by PVHS's engineering students and manufactured by students in the metal shop. The mounting system will be installed by PVHS's engineer.

While waiting for delivery of the video equipment and creation of the mounting hardware, students in Plant and Animal Biology classes will conduct research and gather information on the four species of fish that currently reside in TMERC. They will add this information to the TMERC web site, currently being developed.

Camera equipment and software will be programmed to take images at regular intervals for viewing on the TMERC web site. After spending a predetermined amount of time on the site,

each image will be archived. After learning to identify the four fish species, students will then examine the archived images to determine the total number of fish visible, the number of each species visible and any other significant information from the images. This data will also be added to the TMERC site in both table and graph formats.

Cooperating Individuals

Kevin Kehl, Biology Teacher

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Kevin Kehl teaches Plant and Animal Biology and Biological Research Methods at PVHS and is the video monitoring project coordinator. He will house the video-capture computer in his room, and his classes will analyze the images and data.

Kathy Krucker, Biology Teacher

Palo Verde High School
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(520) 584-7400
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Kathy Krucker is the science department chairperson and was the driving force in getting the TMERC project off the drawing board and into reality. Students in her Honors Oceanography course will assist in the set up of the equipment and will use the data in their research activities.

Heidi Blasius, Fishery Biologist

Region V Fisheries
Arizona Game and Fish Department
555 N. Greasewood Road
Tucson, Arizona 85745
(520) 628-5376 ext. 136
(520) 628-5080 fax

Heidi Blasius is PVHS's contact at the Arizona Game and Fish Department. She obtained all permits for the collecting of the fish and led two collecting trips in which PVHS students were involved. Heidi will continue to be a liaison between the school and Arizona Game and Fish Department.

One contact that has not been thoroughly explored is with the world-renowned Arizona-Sonora Desert Museum (ASDM). In January 2001, Kevin Kehl and Kathy Krucker were invited to present the TMERC wetland to the education department at ASDM. Also on hand were several botanists, geologists, and others. The response was very positive and while no solid connections were made at the presentation the door was left open to future collaborations. Since the ASDM has a population of desert pupfish, this contact is of interest to all parties.

Reference

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Timeline

<i>Time</i>	<i>Event</i>
September 2001	Purchase of camera equipment
October 2001	Creation/upload of general information page for each of four fish species
November 2001	Installation/securing of camera equipment*
November 2001	Creation/upload of video monitoring web site within TMERC main site
December 2001	Begin collection of video data
Continuing	Quantifying/archiving of video data

*Contingent upon delivery of equipment

Itemized Budget

<i>Item</i>	<i>Vendor</i>	<i>Number</i>	<i>Price</i>
Color Underwater Camera	Supercircuits	PC8I UW	\$449.95
Power Supply	Supercircuits	DCI2-500	19.95
Sealed Battery System	Supercircuits	MVLBCS	99.95
Extra Cable, 100'	Supercircuits	EXTIOO	29.95
Battery Holder	Supercircuits	BPI2AN8AA	4.95
Y-Power Parallel Adapter	Supercircuits		4.95
Studio DC10 Plus video card and software	CompUSA	50041522	95.00
TOTAL			\$704.70