

**NAWS CHINA LAKE
MOHAVE TUI CHUB
PROGRESS REPORT
for
2005 - 2006**

Prepared for:
The Environmental Planning and Management Department
Code N45NCW, China Lake

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1.0 BACKGROUND INFORMATION:

1.1 Mohave Tui Chub History:

The Mohave Tui Chub (*Siphateles bicolor mohavensis*) were historically restricted to the Mojave River, from the confluence of the east and west forks at the base of the San Bernardino Mountains to its terminus at Soda Dry Lake. Habitat modifications, including damming of the headwaters and withdrawals of the river's underflow, were major causes of the decline of the species. Due to this decline, the US Fish and Wildlife Service (USFWS) listed the Mohave Tui Chub as endangered in 1970. The California Department of Fish and Game (CDFG) listed the chub as endangered in 1971. Due to the lack of natural habitat, the CDFG and the USFWS established refuges for the rapidly disappearing fish. The Naval Air Weapons Station China Lake (NAWSCL) was chosen as a refuge site and the Mohave Tui Chub were introduced into Lark Seep in 1971. Currently, the chub do not exist in their natural habitat throughout their native range, with the possible exception of MC Spring at Zzyzx.

1.2 Lark Seep System:

The City of Ridgecrest's Waste Water Treatment Facility (WWTF) evaporation and percolation ponds, existing on the NAWSCL since 1945, elevated the already high groundwater mound and resulted in the establishment of Lark Seep. In order to control the expansion of Lark Seep, and to encourage water to flow away from nearby structures and test sites, a system of channels was created. The channels direct the day-lighting groundwater away from NAWSCL facilities northward to the China Lake playa, where G1 Seep formed. This network of channels and seeps is referred to as the Lark Seep System (Figure 1).

2.0 2005 PROJECTS:

2.1 Water Monitoring:

Monitoring the water parameters of pH, dissolved oxygen (DO), temperature and conductivity is an on-going project. The Greenspan CS304 meters (Figure 2), placed at the Mystery Culvert and Chub Med in the North Channel, and in the G1 Channel, record data every 30 minutes 24 hours daily. This year, the meters along the North Channel had problems with animal chewing and required repair. The Chub Med meter had to be sent into the Stevens Water Monitoring Systems company for repairs and calibration and was not returned for three months.



Figure 2: Greenspan Water Meter

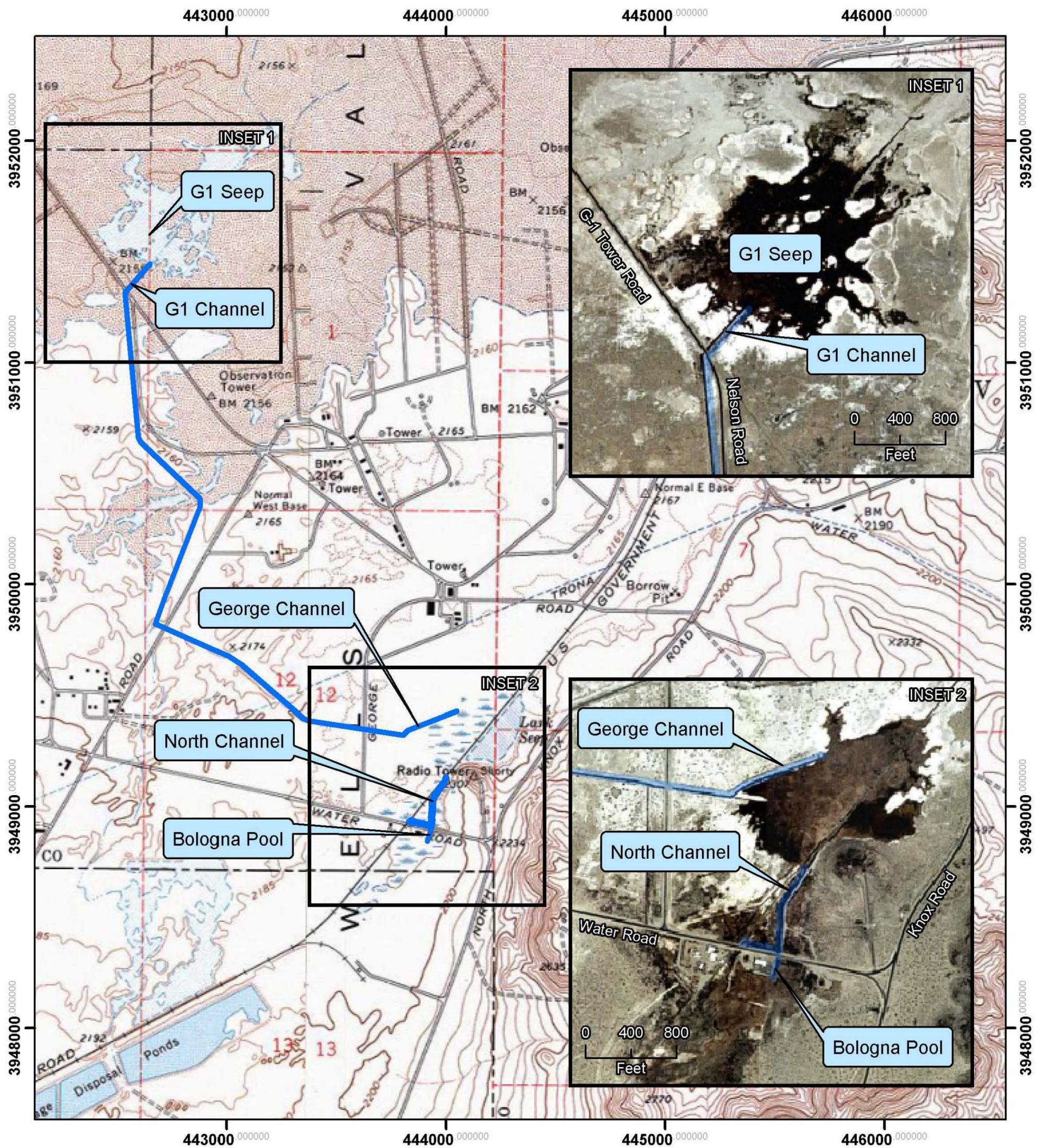
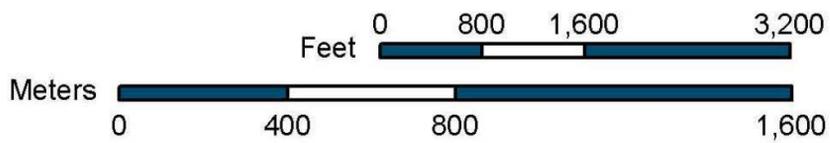


Figure 1: Lark Seep System, NAWS China Lake

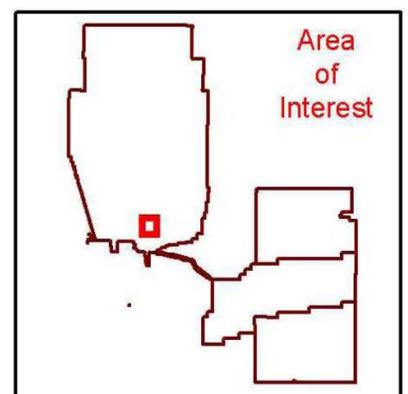
 Lark Seep System



Grid: 1,000-m
Scale: 1:24,000
Base Map: USGS 7.5'
GCS: UTM NAD 83 z11N



Daniel Zelko - Epsilon Systems Solutions, Inc. - 20 Feb. 2004 - /projects/larkseep/larkseep.mxd



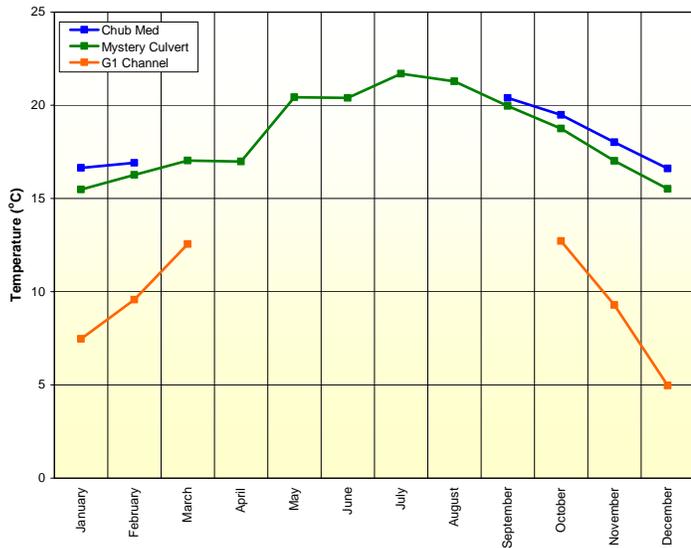


Figure 3: 2005 Monthly average temperature for each water meter position.

Figure 3 indicates that water temperatures in the North Channel at the Mystery Culvert do not greatly vary. Chub Med data is not continuous due to meter probe failures and repair time. Data for the G1 Channel is not complete due to computer download problems.

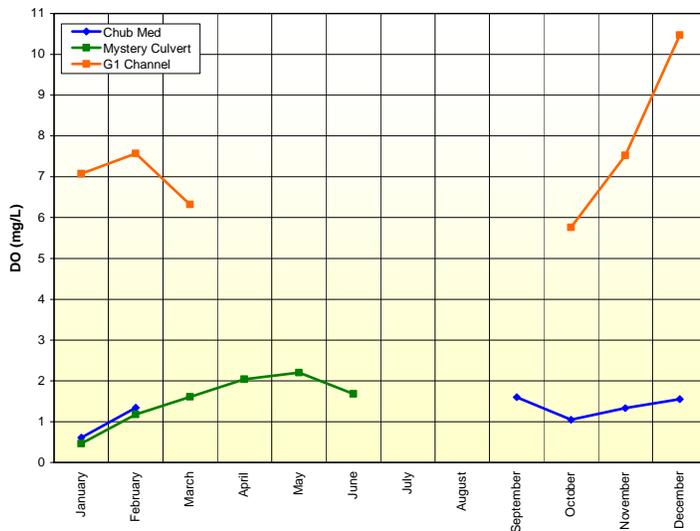


Figure 4: 2005 Monthly average dissolved oxygen for each water meter position.

Figure 4 data is segmented due to computer download problems and meter malfunctions. The data gathered indicates that DO in the G1 channel is significantly higher than in the North Channel.

2.2 Cattail Removal:

In 2004 cattails were only removed within the North Channel utilizing the Jensen Lake Mower (Figure 5). When cattails were cut with the mower, overall water clarity was higher than when cattails were mechanically removed. Other channels were considered for cattail removal with the lake mower; however, access issues precluded the use of the mower in those areas.

Cattails have been removed utilizing a Jensen Lake Mower attached to a ten foot Jon Boat (Figure 6). There is not enough clearance under the bridges for the mower to fit (Figure 7). In order to proceed under the bridge, the mower must be folded back. In the process of cattail removal in the fall of 2005, while lowering the mower to pass under a bridge, the main attachment piece broke. This piece not only allows attachment to the boat, but also holds the cutting blades at a specific level under the water. During the period while this part was ordered for replacement, the cattails grew too thick for mower removal.



Figure 5: Jensen Lake Mower



Figure 6: Mower attached to boat.



Figure 7: Mower does not fit under bridge.

In August 2005, the water level in Lark Seep was receding. In the past, water levels were restored when cattails were removed from along the west side of the railroad bed to the Lark Seep Culvert (Figure 8). On 20 September 2005, mechanical removal of cattails from the Mystery Culvert to Lark Seep Culvert, both sides of the Water Road Culvert, and throughout George Channel commenced in compliance with USFWS biological opinion 1-8-97-F-39R.

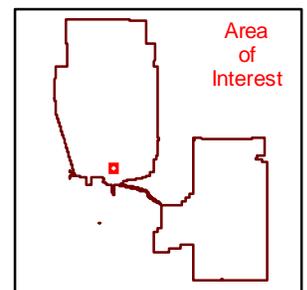
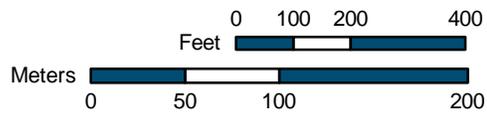
In 2002 the metal rails were removed from the railroad bed. The machine used to remove the rails cracked the cement curb of the Mystery Culvert. During subsequent cattail removal efforts the damaged curb fell into the North Channel away from the culvert and was removed. In 2005 cattails were removed from around the Mystery Culvert. Also a narrow waterway was made from the Mystery Culvert to the Lark Seep Culvert on the west side of the abandoned rail bed. Once this vegetation was cleared, the water levels in Lark Seep returned to normal. However, without the cement curb on the culvert, the heavy equipment used to remove the cattails caused



Figure 8: Lark Seep System, North Channel

 Lark Seep System


 Grid: 250-m
 Scale: 1:4,000
 Base: Orthophotography
 GCS: UTM NAD 83 z11N



a portion of the east side of the culvert to collapse. Water was still moving from the North Channel across a soil berm into a hole and through the remaining culvert to the west side.

An extended reach excavator was used to clear cattails from the Water Road Culvert and George Channel. Cattail growth was dense within George Channel which resulted in approximately 100 fish being retrieved from the spoils, placed into a bucket for recovery, and then returned to the channel. Three known deaths occurred during cattail removal, as chub were not discovered within the spoils in time to revive them.

2.3 Dissolved Oxygen Study:

A study on dissolved oxygen (DO) began in October 2003. This study characterized the DO levels for ten-foot increments along the North Channel for the top, middle, and bottom depths of the water column. The resultant data will give a better understanding of the DO levels within the North Channel. This study is an ongoing event with samples being gathered on a quarterly basis. However, the fall 2005 sampling was missed due to extenuating circumstances.

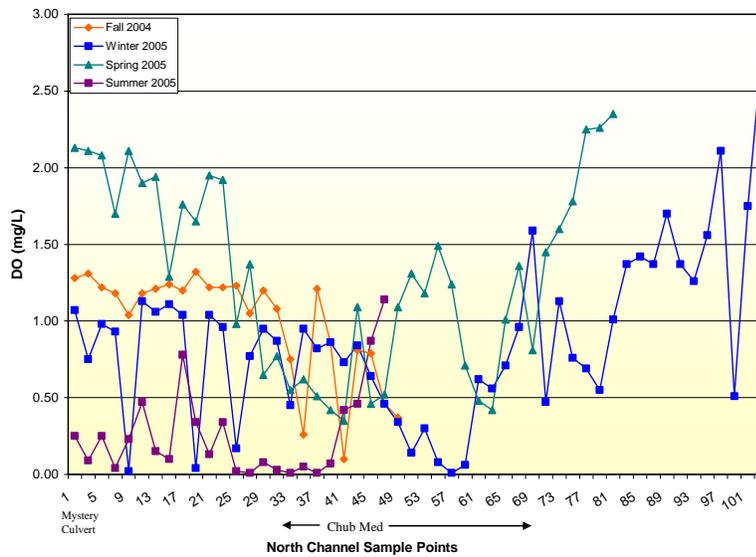


Figure 9: 2005 dissolved oxygen values in the bottom column of the North Channel.

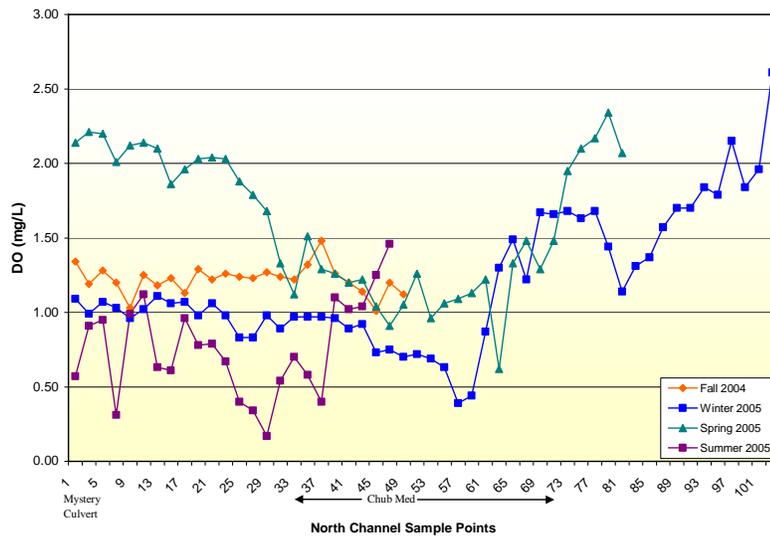


Figure 10: 2005 dissolved oxygen values in the middle column of the North Channel.

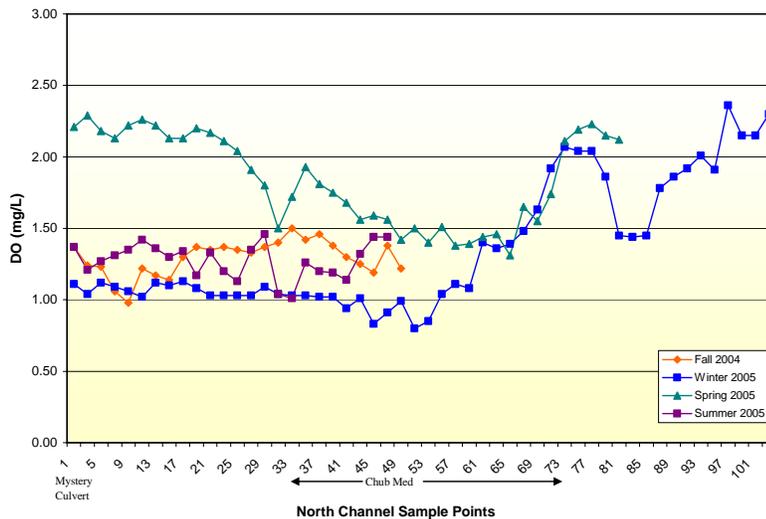


Figure 11: 2005 dissolved oxygen values in the top column of the North Channel.

The 2005 dissolved oxygen study results indicate that DO levels throughout the channel are low (Figures 9-11). DO levels at Lake Tuendae in Zzyzx, California average around 10 ppm. The best DO values occur in the spring; however, that is when chub spawn so a population survey may not be conducted during this timeframe. The next best DO levels occur in the fall. The fall is when ambient temperatures are dropping but the water temperatures are still high enough for the fish to be active, making it an acceptable time to conduct a population survey. The fall and summer data sets are short due to cattail overgrowth. It is unknown why the highest DO values

are in the western 'L' section (points 81-103) of the North Channel. The water is very shallow in this section and fish have not been observed in this area, therefore, monitoring of DO in this area was discontinued as a result of these observations.

Historically traps have been placed on the bottom of the channel. The results indicate that trap placement should be in the middle of the water column, as DO levels are higher and more stable at that level.

2.4 Tamarisk Removal:

Tamarisk removal occurred during 2004. The tamarisk trees were cut and the stumps treated with Rodeo. All the trees grew back with even fuller foliage. In 2005 a different herbicide combination, Garlon 4 and Remedy, was used on the tamarisk around the Waste Water Treatment Facility with better results.

2.5 North Channel Access:

The North Channel Access Road has begun to erode (Figure 12). The erosion of the road has resulted in problems with access in order to complete DO and cattail removal projects. Plans are being drafted to utilize the abandoned railroad bed to the west of the channel for future access. The USFWS is being consulted for this project.



Figure 12: Erosion of North Channel Road.

3.0 2006 PROJECTS:

3.1 Water Monitoring:

Monitoring the water parameters of pH, dissolved oxygen (DO), temperature and conductivity is a continuous effort. The Greenspan CS304 meters placed at Chub Med and the Mystery Culvert in the North Channel, and in the G1 Channel, record data every 30 minutes.

The meter at the Mystery Culvert has not recorded data since mid 2005. This meter was removed from the channel and sent into Stevens Water Monitoring Systems for repairs and calibration at the end of October 2006. The meter was returned to the channel in January 2007.

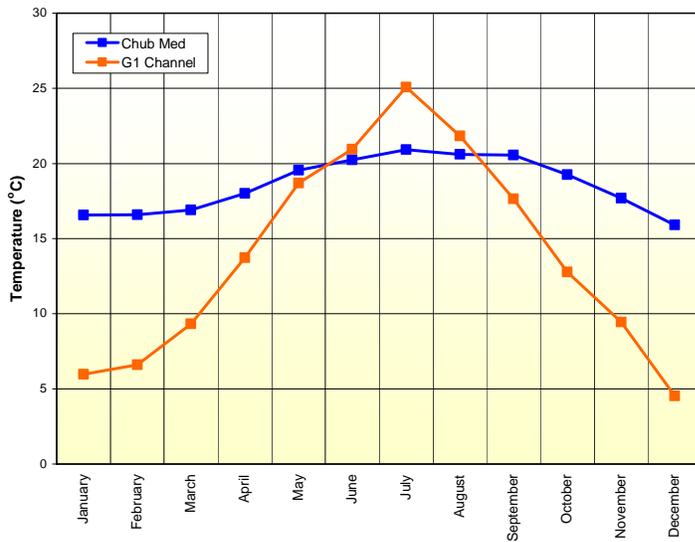


Figure 13: 2006 Monthly average temperature values for Chub Med and G1 Channel.

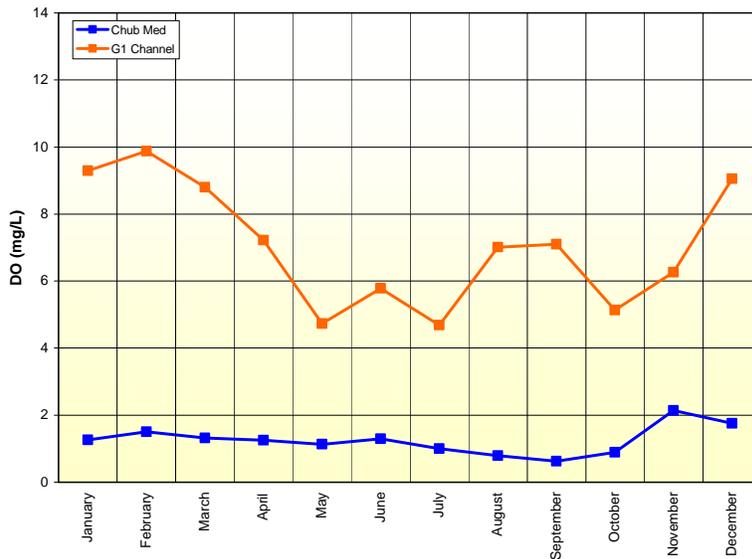


Figure 14: 2006 Monthly average dissolved oxygen values for Chub Med and G1 Channel.

At Chub Med the temperatures remain relatively stable but the DO is low (Figures 13-14). The dissolved oxygen at the G1 Channel is much higher than the North Channel.

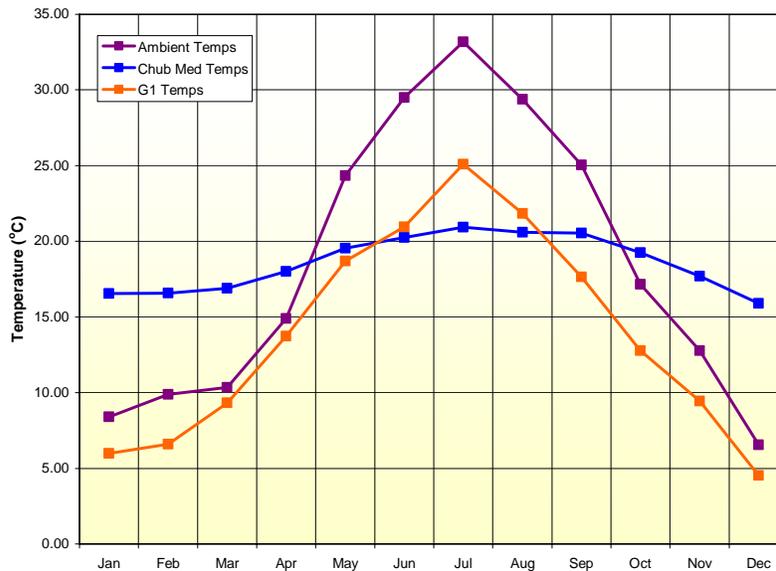


Figure 15: 2006 Ambient temperatures vs Chub Med and G1 water temperatures.

Temperatures at the G1 Channel appear to change according to ambient air temperatures (Figure 15). Ambient air temperatures appear to influence water temperatures in areas with lower water levels.

3.2 Cattail Removal:

The dense cattail growth within the North Channel required mechanical removal; therefore removal of cattails from the North Channel began on 20 September 2006 in accordance with biological opinion 1-8-97-F-39R. Cattails were only removed from the North Channel and the terminus of the G1 channel using an extended reach excavator. No chub were discovered in or rescued from the spoils.

3.3 DO Study:

Due to cattail overgrowth the DO study did not take place until October 2006 after the cattails were removed.

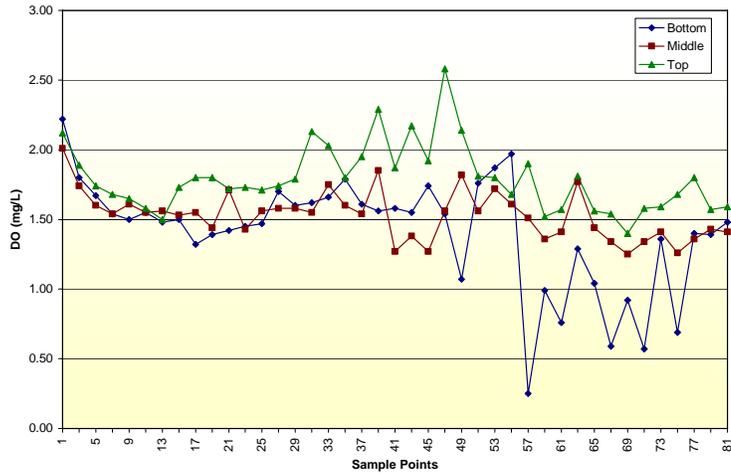


Figure 16: Fall 2006 North Channel dissolved oxygen study results.

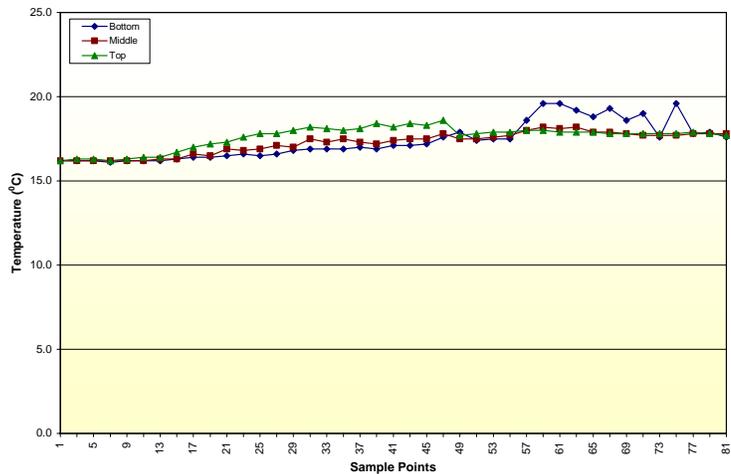


Figure 17: 2006 North Channel fall temperature results.

Figures 16-17 are the results of the data gathered in October. Dissolved oxygen in the bottom of the water column, especially in Chub Med, is low. Temperatures are stable throughout the columns of water.

3.4 Tamarisk:

Tamarisk trees were removed around the Waste Water Treatment Facility. The herbicides Garlon 4 and Remedy were used to treat the stump after the tree was cut.

3.5 North Channel Construction:

Access along the North Channel has become more challenging throughout the years. The water surface along most of the channel is between 6-10 feet lower than the road. The Mystery Culvert, which is at the end of the access road, is the only place where the boat can be placed into the North Channel. However, winter storms have caused higher occurrences of erosion along the road making it difficult to gain access to the channel (Figure 18). Alternative methods of access needed to be developed. After research and discussion with NAWSCCL planners and construction crews, it was decided that the abandoned railroad bed would make a good alternative, but there would have to be additional roads made for access directly to the channel.

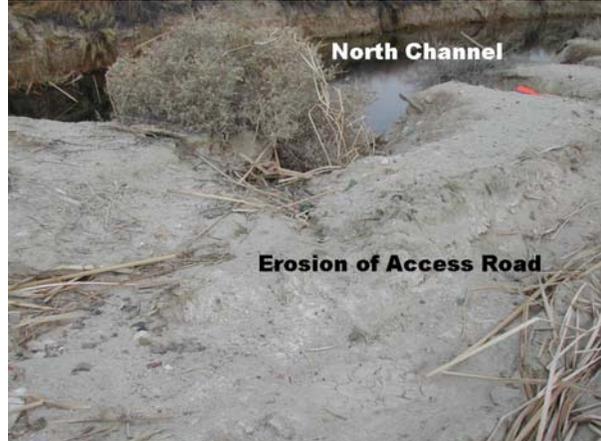


Figure 18: Erosion of North Channel access road.

A future project goal was to conduct a population survey in the G1 Seep; however, the G1 Channel road ended with a steep drop and a huge boulder. To this date, a population survey has never been conducted in the G1 Seep because of access issues.

In 2005 USFWS was consulted in regard to making the railroad bed along the west side of the North Channel into a new access road, with additional perpendicular roads leading directly to the channel, and to establish a boat ramp leading into the G1 Channel. By March 2006 the consultation resulted in a no adverse affect determination (letter PAS 2678.4081.5240, dated 30 Mar 06).

Work began on 28 August 2006 and finished on 15 September 2006 (Enclosure 1). Susan Williams, an Epsilon Systems contract biologist, monitored the project to ensure that all USFWS mandates were adhered to. During construction the Mystery Culvert fully collapsed, blocking water flow to Lark Seep. In order to alleviate this problem, a ditch was dug across the railroad bed to allow flow to the west side. A rock barrier was constructed along the east bank of the culvert, which allows water flow but restricts the movement of fish. Due to the change in water flow at the Mystery Culvert, the railroad bed between the Mystery Culvert and the Lark Seep Culvert is gradually being flooded (Figure 19). This area will be monitored to document further changes.

After the collapse of the culvert, chub were observed in the small pool on the west side of the culvert. This small pool was made when cattails were removed to ensure flow to Lark Seep and has the potential to choke out with cattails. This is not beneficial habitat for the chub; therefore, the decision was made to move them back to the North Channel. A ¼ inch mesh minnow trap was placed in the pool using bread as bait. The traps were never in the water longer than two hours. Table 1 shows number of fish caught and returned to the North Channel. Trapping only occurred when chub were observed and before the water clarity was obscured due to the mechanical removal of cattails.



Figure 19: Mystery Culvert and portion of railroad bed being covered by water.

Table 1: Results of trapping efforts on the west side of the Mystery Culvert.

	8/30/06	8/31/06	9/7/06	9/11/06	
No. Fish Caught	43	7	27	3	
Overall Total					80

4.0 FUTURE PROJECTS:

4.1 Water Monitoring:

Water parameters of DO, temperature, pH and conductivity will continue to be monitored daily with the Greenspan meters. Studying DO within the water columns will also continue on a quarterly basis. All water data will be used to determine better trap placement and will help to determine future projects.

4.2 Population Survey:

During the 2002 population survey there were chub fatalities. A determination was needed on what caused the fatalities and how to prevent them in the future, so the dissolved oxygen study was implemented. Every new data set gathered from the DO study gives additional data, but the trend shows that the bottom water column has the least amount of DO; therefore, traps should be suspended within the middle column of water. Access to the North Channel has also played a role in delaying commencement of a population study. Easier access to the North and G1 Channels (along with dissolved oxygen information) will allow a population study to be conducted in early fall 2007. The study will take place according to USFWS biological opinion 1-8-97-F-39R as modified 3 Jul 2002. Also, an attempt will be made to gather population data from Lark and G1 Seeps.

4.3 Bullfrog Eradication:

Studies have been conducted which indicate that bullfrogs are voracious feeders. They have been known to consume fry, therefore they should be removed from the chub habitat. One method of removal that has proven effective is trapping the tadpoles with a small minnow trap. Another proven method is gigging, which involves removing adult frogs at night. A program to eradicate bullfrogs from the North Channel of the Lark Seep System should be designed and implemented.

4.4 Cattail Removal:

Mechanical removal of all cattails within the North Channel was accomplished in the fall of 2006 and water clarity decreased (as per personal observation). It is believed that water clarity is tied to DO levels. Therefore, all future cattail removal should be accomplished with the Jensen Lake Mower to enhance water clarity and DO. Cattails should be cut monthly to keep them within manageable levels.

New North Channel Access Route

