Proposed 2002 Mohave Tui Chub Project Plans

1.0 Background Information

1.1 Lark Seep System

The City of Ridgecrest's Waste Water Treatment Facility (WWTF) evaporation and percolation ponds, located on the Naval Air Weapons Station, China Lake (NAWS) since about 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 were created directing water not only to and from Lark Seep but also to the China Lake playa where G1 Seep formed. This network of channels and seeps are collectively referred to as the Lark Seep System and all maps referenced within this document are in appendix 1.

1.2 Previous Mark-Recapture Surveys

Since 1995, annual mark and recapture surveys have been conducted to estimate the chub population at China Lake. Historically, trapping was conducted around the last weekend in May or first weekend in June of each year. The mark and recapture methodologies were as follows: At each trap site (maps 1 and 2) a modified minnow trap was baited with cat food, placed in the channel at a pre-defined location, and left for approximately 12 hours (usually overnight). The next morning the traps were taken out and the fish were weighed, measured, the left pectoral fins were clipped, and then the fish were released. The trap was then reset using the same methods as the previous day. The next day fish were weighed, measured and checked for the left pectoral fin mark before being released.

To estimate the chub population, the Lincoln-Peterson calculation method was used. It assumes that fish populations are static during the trapping period (i.e. no migrations, births, or deaths). The calculation combines the number of fish caught the first day with the number of fish captured the second day and divides the total by the recapture number, which determines approximate population. Due to the minimal rate of recapture during population surveys, the overall confidence in the population numbers was low.

For example the population survey in 2001 resulted in 222 fish captured the first day and 139 fish captured the second day with only 2 recaptured fish. After using the Lincoln-Peterson equation the population estimate was 10,406 individuals with a confidence interval of ±10,021 individuals.

1.3 Habitats Within Lark Seep System

To obtain more reliable population estimates, it was decided to divide the Lark Seep System into various habitat types. In the determination of habitat types the defining features are depth and width of the channels, as well as the existence of contiguous habitat. While designating different habitat types it was determined that some areas in the Lark Seep System are not suitable for sustaining a viable chub population. For example, there is a length of channel, from the west side of George Road to the G1 Road, characterized by numerous intermittent shallow areas and

changes in channel bed elevation leaving little contiguous habitat (map 3). Historical trap sites 8 and 9 were located along this length of channel. The average number of fish caught at trap site 8 was less than 10 and at site 9 the water became too shallow to submerge the trap. Because of the poor habitat and historic population survey data showing few captures, traps will not be placed in this channel during future population surveys.

The three remaining habitat areas are the North channel (map 4), the channel east of George Road (map 5), and the channel east of G1 Road (map 6). The L-shaped North channel begins parallel with Water Road and widens at the culvert where water flows in from the Bologna Pool. The channel then proceeds approximately 775 feet to the north. Two-hundred feet north of the Water Road culvert the channel was widened to approximately 25' across and 10 feet deep creating the enhanced habitat referred to as Chub Med. This part of the channel extends for approximately 250'. The channel then narrows down to approximately 19' wide with an approximate depth of 3.5 feet for about 300' before widening and pooling at the end (Mystery) culvert. Cattails clumps are dotted along the channel length. The channel banks are partially vegetated with pickle weed, salt grass, *juncus* and some tamarisk.

The channel east of George Road is approximately 1,322 feet long and is a narrow and shallow, v-notch channel approximately 15 feet across at the widest point with an average depth of 2 feet. A large field of cattails exists between Lark Seep and the George Road channel with no obvious connecting channel; however, water flows quickly into the east end inlet of the channel. *Juncus* grows in the shallow water at the inlet and the rest of the channel supports a mixture of cattail and *juncus* clumps.

The G1 channel's widest point is 18 feet with a depth of 3 feet with cattails growing only at the beginning and at the end of the channel. The channel is approximately 500 feet long with a uniform, wide bottom shape. The end of the channel opens into a pond with dense cattail growth all around and is the beginning of G1 seep.

Depending upon the seasons and ambient temperatures the water in the channels can be clear or have a prominent surface and subsurface algal bloom. The water in the North and G1 channels appears clearer than the water in George Road channel, which often appears rust colored due to dissolved organic acids. Trapping and population census will occur separately for each habitat type.

2.0 Population Calculations

2.1 Lincoln-Peterson

The historically used Lincoln-Peterson method of population calculation assumes a closed system. A closed system is defined as a population in which there is no recruitment (birth or immigration) or losses (death or emigration) during the period of study. As discussed previously, the confidence interval results indicate that this is not an acceptable method of population calculation for the Lark Seep System.

2.2 POPAN-5

To analyze the data from the 2002 Mark-Recapture surveys POPAN-5 from the University of Manitoba will be used. POPAN-5 is a data maintenance and analysis system for mark-recapture data and integrates many different methods of census calculations. POPAN stands for POPulation ANalysis. It is a computer system for creating and maintaining files of mark-recapture data from animal sampling experiments of open populations. Statistics can be extracted from the entire file or subsets of the file, and a number of standard analyses can be carried out, using models of the Jolly-Seber type. The main assumptions of the Jolly-Seber method are:

- no mark loss and correct identification of marks
- homogeneity of capture probability for all animals alive just before sample
- homogeneity of survival for all animals in the population just after sample

PROPAN-5 is designed to maintain the complete data from an experiment together, including not only data on individual or batch histories, but also the meta-data on animal attributes and sample time characteristics. Meta-data is information that describes data, such as the units of measure. The user can then split out subgroups of animals and subgroups of the sample times for individual or comparative analyses. It also has extensive data checking to ensure that the raw data read in is consistent with the meta-data.

3.0 Proposed 2002 Mark and Recapture Survey

3.1 Equipment to be procured

- 150 qt cooler
- 70 qt cooler
- 4” PVC cut lengthwise with ruler glued into bottom
- fish anesthetic
- small generator
- bubbler equipment
- parachute cord
- surgical gloves
- first aid kit
- Rubbermaid storage containers
- large buckets

3.2 Dates

7-10 October 2002

Previous surveys during late May or early June resulted in the inadvertent capture of spawning fish. After comparing air and water temperatures, it was decided that late October or early November had similar favorable trapping conditions, with a much lower risk of capturing spawning fish. Therefore, the 2001 survey was conducted 12-14 November. Temperatures were somewhat cooler, but no spawning fish were trapped. For 2002, it was decided to conduct the survey in October, where ambient temperatures should be even closer to that of the original trapping sessions.

3.3 Trapping Scheme

During the 2001 survey visual observations were made that some fish were attracted to the trap but could not fit into the trap opening. These observations resulted in the conclusion that possibly a significant percentage of the population were not being counted. To investigate this idea, the opening of one trap was modified from one inch by two inches wide to two inches by three inches and placed at historical trap site 4 (North channel Chub Med area) for approximately 3 hours during the day. Another smaller opening with smaller mesh trap was set at historical trap site 2 (Bologna Pool) for the same time period. The North channel trap captured four very large fish and trap 2 caught some chub fry. These results helped validate the visual observations of larger fish in the North Channel. For the 2002 trapping event there will be three traps with different size trap openings placed at each trap site. The sizes of the different trap openings will be as follows: Large = 2 1/16" x 3", Medium = 1 ½ " x 1 3/4", and Small = 1" x 1 3/16". The large and medium traps are made with ½ inch mesh and the small trap is made up of ¼ inch mesh wire.

The results of the 2001 survey also suggest that fish either became "trap wise" or that the traps were set during low fish activity times. Traps were set in the late afternoon with approximately 2 hours of daylight remaining and retrieved again early the next morning with less than 2 hours of daylight. It is possible the chub require more light before becoming active enough to scavenge for food. In order to resolve this problem the traps will be placed for a longer period of time during daylight hours as well as alternating trap days within different channel habitats.

The trap sites of the past will be changed in order to be consistent with the different habitat types. The channels were measured on August 6, 2002. The North channel had a water volume of approximately 64,957 ft^3, George channel water volume was approximately 25,593 $ft^{3,}$ and G1 channel water volume was approximately 20,160 ft^3. The volumes were divided by number of trap sites to achieve similar volumes per trap site. At the North channel there should be five trap sites; however, due to channel inaccessibility in some areas there will only be four trap sites in that channel. There will be two trap sites within the Chub Med portion of the North channel as well as trap sites at both ends. There will be two trap sites at each of the George and G1 channels located close to the historic locations. The Bologna Pool will not be trapped due to low dissolved oxygen levels. Approximate trap sites are depicted on maps 4-6.

Traps will be set in the North channel in the late afternoon on 20 October, 2002. They will then be processed (fish extracted from trap, measured, marked and released) in the afternoon on 21 October, to allow for the most fish activity time. The traps will then be set at George and G1 channels. Those traps will then be processed in the afternoon of 22 October and the traps re-set at the North channel. North channel traps will again be processed on 23 October afternoon and the traps re-set at George and G1 channels, which will then be processed the next afternoon.

3.4 Marking Scheme

For the 2002 survey the US Fish and Wildlife Service has approved (in an amendment to the Biological Opinion 1-8-97-F-39R, Naval Air Weapons Station, China Lake, Kern County, California) the use of Visible Implant fluorescent Elastomer (VIE) marking methods instead of fin clipping for marking the chub. The VIE method has been shown to be more reliable than fin clipping and results in less mortality (Haines and Modde 1996). Based on previous trials, the

method has highly reliable retention rates, provides distinct visual marks, and can be easily and quickly applied to a chub's head and jawbone. Fish from each habitat type will be marked with a different color (i.e. North channel mark yellow, George channel mark orange and G1 channel mark pink). The new marking method will also note if there is movement from one habitat to another.

3.5 Processing events

Two ice chests, residing in the rear of a pickup truck, will be filled with water from the channel. Oxygen tanks will then be set up to aerate the water within the coolers. Cooler 1, the larger cooler, will have channel water and cooler 2 will have channel water with antibiotics. Anesthetic will be mixed with channel water into a large bucket allowing a small number of fish to be anesthetized at a time. At trap site 1 of the North channel each trap (large, medium, small) will be pulled from the water in turn so as to note the number of fish in each individual trap and the fish placed into cooler 1. Up to twenty fish will then be scooped into the anesthetic bucket and two people will take fish from the bucket, measure and VIE mark them before putting them into the recovery cooler. A person will be recording data and two other people will be monitoring anesthetic and recovery fish. Once the fish have recovered they will be scooped with a net and placed into a bucket filled with channel water, and released back into the channel.

4.0 Water Quality

24-hour meters have been installed in two places along the Lark Seep System. As of May 2002 one meter, made by Greenspan, was installed at the Chub Med site. Another meter, made by In-Situ, Inc., was installed at the Bologna pool July 2002. The meters are being evaluated as to which will be the most reliable for this environment. Both meters have software that downloads data directly to a PC and the ease of use as well as data format is still being evaluated. Water quality readings still should be taken at all other sites until the proper 24-hour meters can be purchased and installed for the other zones of the Lark Seep System.

5.0 Bullfrog Eradication

Bullfrogs exist in abundance in the Lark Seep System and are voracious feeders, which need to be eradicated. One method would take place at night with a high power light that can pick out the frogs to be exterminated using a gig or pellet gun. Due to security measures at the NAWS/CL a gig would be the preferred tool. A small boat would be needed to patrol the channels in search of frogs to eradicate. It is unsure at this time if Bullfrog eradication will take place during 2002.