CY 2003 NAWS Mohave Tui Chub Annual Report

1.0 Background Information:

1.1 Lark Seep System:
The City of Ridgecrest's Waste Water Treatment Facility (WWTF) evaporation and percolation ponds, existing on the Naval Air Weapons Station (NAWS), China Lake 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 NAWS, China Lake facilities northward to the China Lake playa, where G1 Seep is formed. This network of channels and seeps is referred to as the Lark Seep System (Figure 1).

1.2 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 (CADFG) listed the chub as endangered in 1971. Due to the lack of natural habitat the CADFG and the USFWS established refuges for the rapidly disappearing fish. NAWS China Lake 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 within its native range with the possible exception of MC Spring at Zzyzx.

1.3 Previous Mark/Recapture Survey:
During the population survey conducted in 2002, trapping within the North Channel (Figure 2) resulted in fish fatalities. Although all traps were set in the same manner; fatalities resulted. Because an oxygen deficiency was suspected, it was decided that trapping would not occur in 2003 until a dissolved oxygen study, combined with a topographical analysis, was conducted for the North Channel. It was anticipated that this data would result in a better understanding of the dissolved oxygen levels throughout the North Channel and also would establish trap placement for future mark-recapture surveys.

2.0 2003 Projects:

2.1 Water Monitoring:
Monitoring the water parameters of pH, dissolved oxygen, temperature and conductivity is an on-going effort. In 2003, the In-Situ water meter, which gathered data for the Bologna Pool, was rendered inoperable. D-Cell batteries powered this meter, and although the meter operating instructions suggested an operating period of six months, the actual period of performance was unpredictable. These batteries were also very

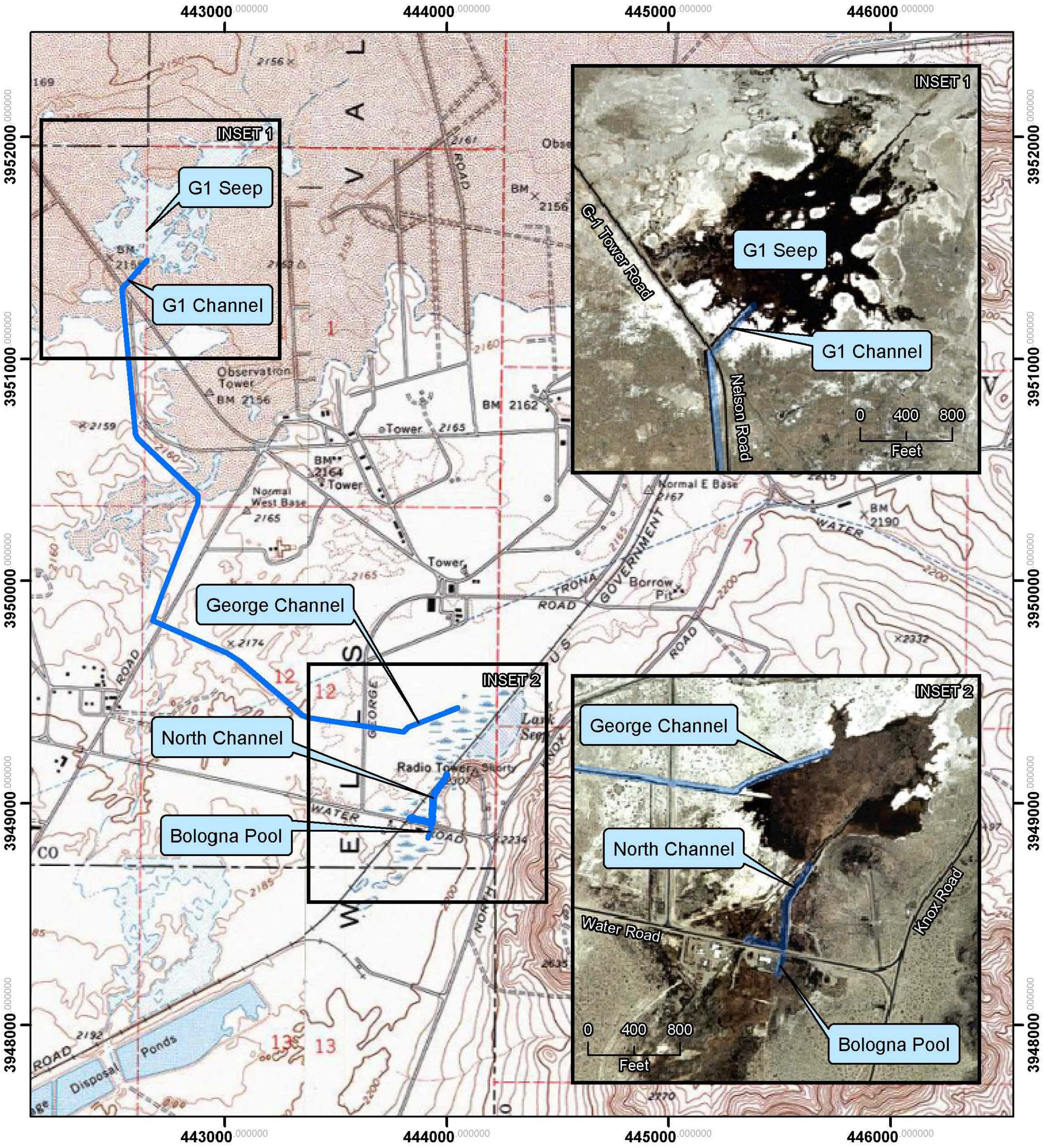


Figure 1: Lark Seep System, NAWS China Lake

Lark Seep System

Feet 0 800 1,600 3,200

Meters 0 400 800 1,600

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

EPSILON Systems Solutions, Inc.

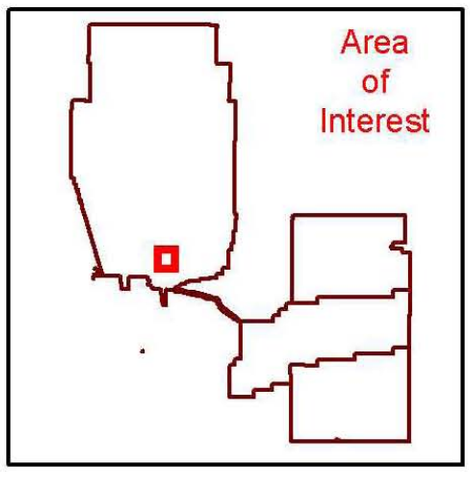


Figure 2: Lark Seep System, North Channel

Lark Seep System

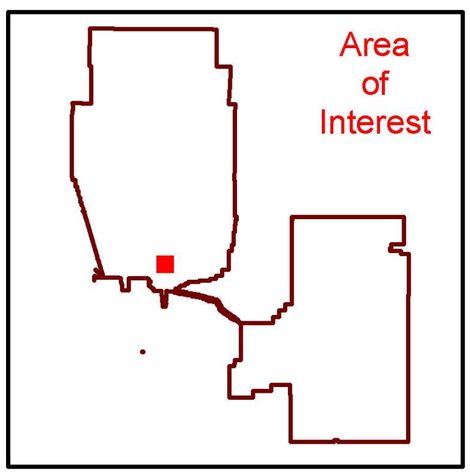
Feet: 0 100 200 400

Meters: 0 50 100 200

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

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

EPSILON Systems Solutions, Inc.



difficult to access. The software required to download the collected data was complex to program and the resultant data was not in a format that could be easily manipulated for reporting. Therefore, this meter was not replaced due to the unacceptable operation of the meter and the determination that fish may no longer inhabit the Bologna Pool.

The Greenspan CS304 meter, which was placed in the Chub Med area in 2002, has been recording data reliably. The software is easy to use and the data gathered is easily formatted for future graphing. Since the original Greenspan meter has operated reliably, two additional Greenspan 24-hour water meters were purchased in 2003. One is placed at the Mystery Culvert to gather additional data on the North Channel, and the other was placed in the G1 Channel (Figures 1 and 2).

Data gathered from the Chub Med meter for 2003 (Appendix A) indicates that average monthly temperatures changed very little throughout the year and dissolved oxygen varies greatly. The data variation indicates that more data is needed before dissolved oxygen trends can be determined.

2.2 Cattail Removal:

The biological opinion (1-8-97-F-39R) issued to NAWS China Lake requires that cattail removal be accomplished from 1 October through 31 January. Due to fiscal and environmental issues, NAWS China Lake requested that the USFWS modify the existing biological opinion so that cattail removal could begin on 15 September. Once the biological opinion modification was approved, cattail removal began on 15 September 2003 with the help of an extended reach excavator. All removal efforts were conducted in accordance with guidelines established in the biological opinion.

In order to maintain water flow within the channels, cattail vegetation removal is performed on an annual basis. However, due to fiscal and scheduling conflicts, previous cattail vegetation removal was last performed in December 2001 resulting in a much denser vegetation growth than normal. Chub were discovered within the vegetation being removed along George and G1 Channels. The fish were removed from the vegetation spoils and recovered in a bucket of water before being returned to the channel. Careful monitoring resulted in approximately 100 chub recovered from George Channel and five from G1 Channel. In previous years chub were not discovered during cattail removal; however, it is possible that the dense vegetation did not allow the chub to escape the excavator quickly enough to prevent being removed with the vegetation.

2.3 Dissolved Oxygen Study:

In order to determine the cause of the chub fatalities during the 2002 population survey a study on dissolved oxygen was undertaken in October 2003. This study characterized the dissolved oxygen levels for ten-foot increments in the top, middle, and bottom depths of the water column along the North Channel. The resultant data will give a better understanding of the dissolved oxygen levels within the North Channel in order to determine trap placement within the channel for future population surveys. Upon completion of the study in October it was decided that additional data needed to be gathered. Therefore, this study is an on-going event with samples being gathered on a

quarterly basis. The completed report with results will be included with the 2004 annual report.

The preliminary results of the study conducted in October indicated that dissolved oxygen levels at the bottom of the channel, especially in the deeper Chub Med area, are very low, below 0.5 mg/L in areas. There was also a direct correlation between temperature and dissolved oxygen – higher temperatures led to lower dissolved oxygen levels. Preliminary results indicate that the best trap placement would be in the middle of the water column where dissolved oxygen levels were higher and temperatures lower.

2.4 Topography Study of North Channel:
In addition to determining dissolved oxygen levels along the North Channel, an extensive topographical survey was conducted in the fall of 2003. The study was conducted using Trimble GPS survey equipment and the gathered data was converted into a three-dimensional computer model. This model will be added to the NAWS China Lake GIS and all data gathered from the dissolved oxygen study will be added to it. The completed model will indicate areas of low dissolved oxygen where trap placement would be detrimental to chub survival and will be provided with the 2004 report.

2.5 Operating Procedures:
In order to ensure quality data, standardized operating procedures (SOPs) were developed for the downloading of the water meters. The enclosed procedures (appendix B) document the proper method of data retrieval as well as the formatting of the resultant data.

2.6 Meetings:
The National Park Service conducted a meeting at Zzyzx, California in September 2003 for the purpose of discussing concerns regarding the Mohave tui chub. NAWS China Lake participated in the multi-agency meeting where many objectives were discussed as well as options to successfully reach the objectives outlined at the meeting. The outcome of the meeting was positive and resulted in more extensive research efforts being explored for the future.

3.0 2004 Future Projects:

3.1 DO Study:
Continue sampling of the North Channel in order to gain comprehensive data analysis in order to determine dissolved oxygen levels and future trap placement.

3.2 Cattail Mower:
Annual cattail removal is a costly process and NAWS China Lake has been searching for other removal methods. The CDFG Bishop Office uses a lake mower to control their cattails with great success. NAWS China Lake purchased a portable Jensen lake mower and has gained approval from the USFWS for its use. In accordance to the agreement with USFWS (BO 1-8-87-F-39R as amended on 8 Aug 03 (Appendix C)), the use of the mower will be limited to the North Channel. The mower will be attached to a small boat,

which will be towed along the channel by two people walking on opposite sides of the channel. The cattails will be cut at a depth of no more than two feet below the water surface and the clipped cattails will be removed from the channel and disposed of in an upland area. During 2004, the Jensen lake mower will be used to control cattail re-growth along the North Channel with expectations that excavator removal will no longer be an annual requirement.

3.3 Tamarisk Removal:
Tamarisk will be removed with the cut stump and herbicide application method in the spring of 2004. The tamarisk trees to be removed are along the North Channel as well as upwind along the Waste Water Treatment Facility evaporation/percolation ponds. The herbicide Rodeo will be used along the North Channel and Garlon 4 will be used around the evaporation/percolation ponds.

3.4 Population Determination:
The results of the dissolved oxygen study will determine if a mark/recapture survey will take place in October 2004 as well as determining trap placement within the North Channel.

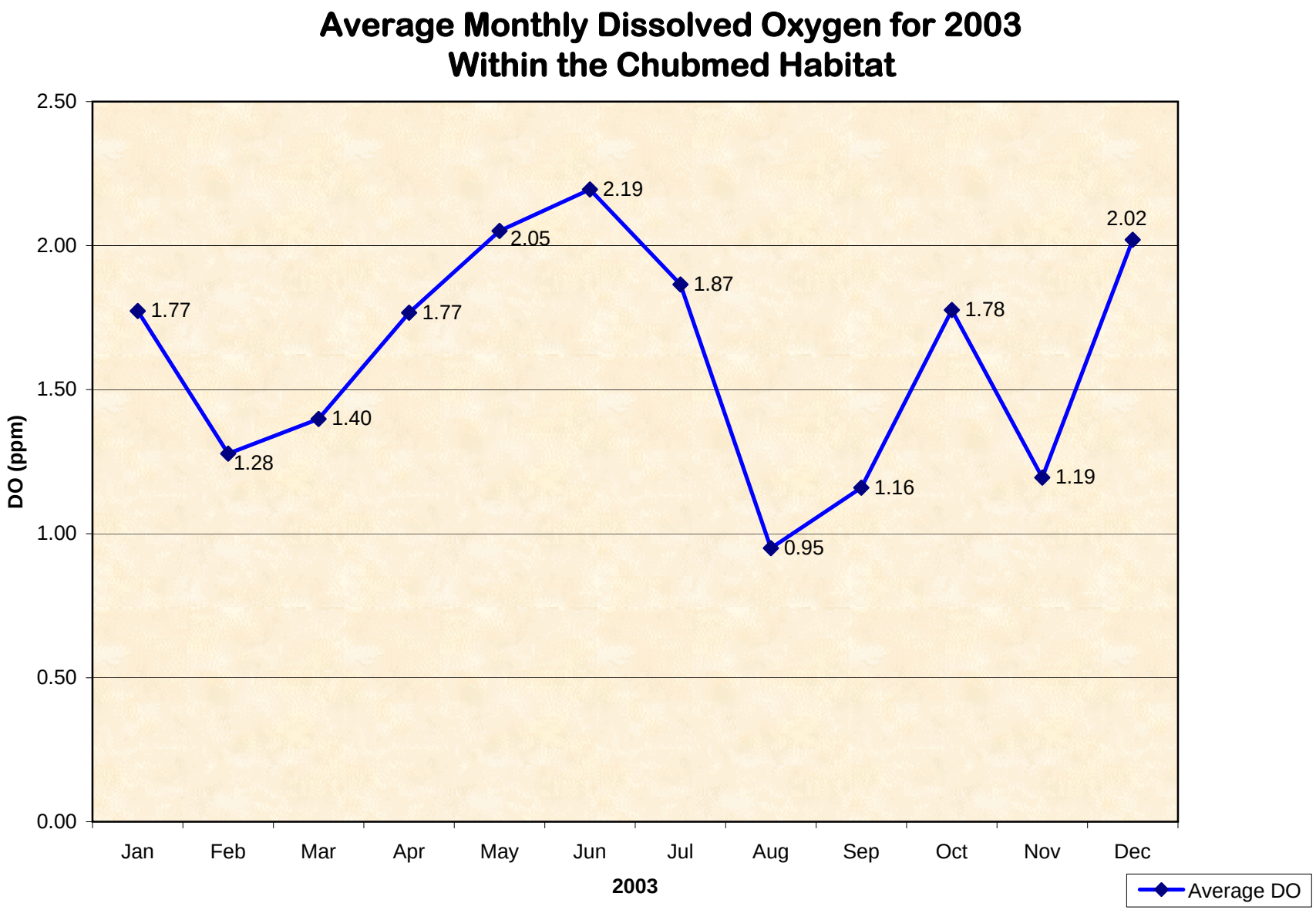
USFWS has indicated an interest in determining the presence or absence of chub in Lark Seep. Past intermittent trap placement within Lark Seep resulted in no chub captured. These results indicated the possibility that chub do not inhabit Lark Seep. These past trapping efforts in Lark Seep only included traps placed along the shores of the seep. It is possible that if traps were to be placed towards the center of the seep, closer to the large cattail growths that form in this area, they may result in the capture of chub. It has been proposed that a presence/absence survey be conducted within Lark Seep during the spring of 2004. If this study takes place, traps will be placed closer to the center of the seep with the aid of a small boat.

Another area of interest to the USFWS at NAWS China Lake is G1 Seep; however, access to the open water is restricted by a high-density growth of cattails along the shoreline. The surrounding area of G1 Seep is playa and, therefore, too moist for cattail removal to occur with large equipment such as an excavator. Access in order to conduct a presence/absence survey at G1 Seep is still being discussed.

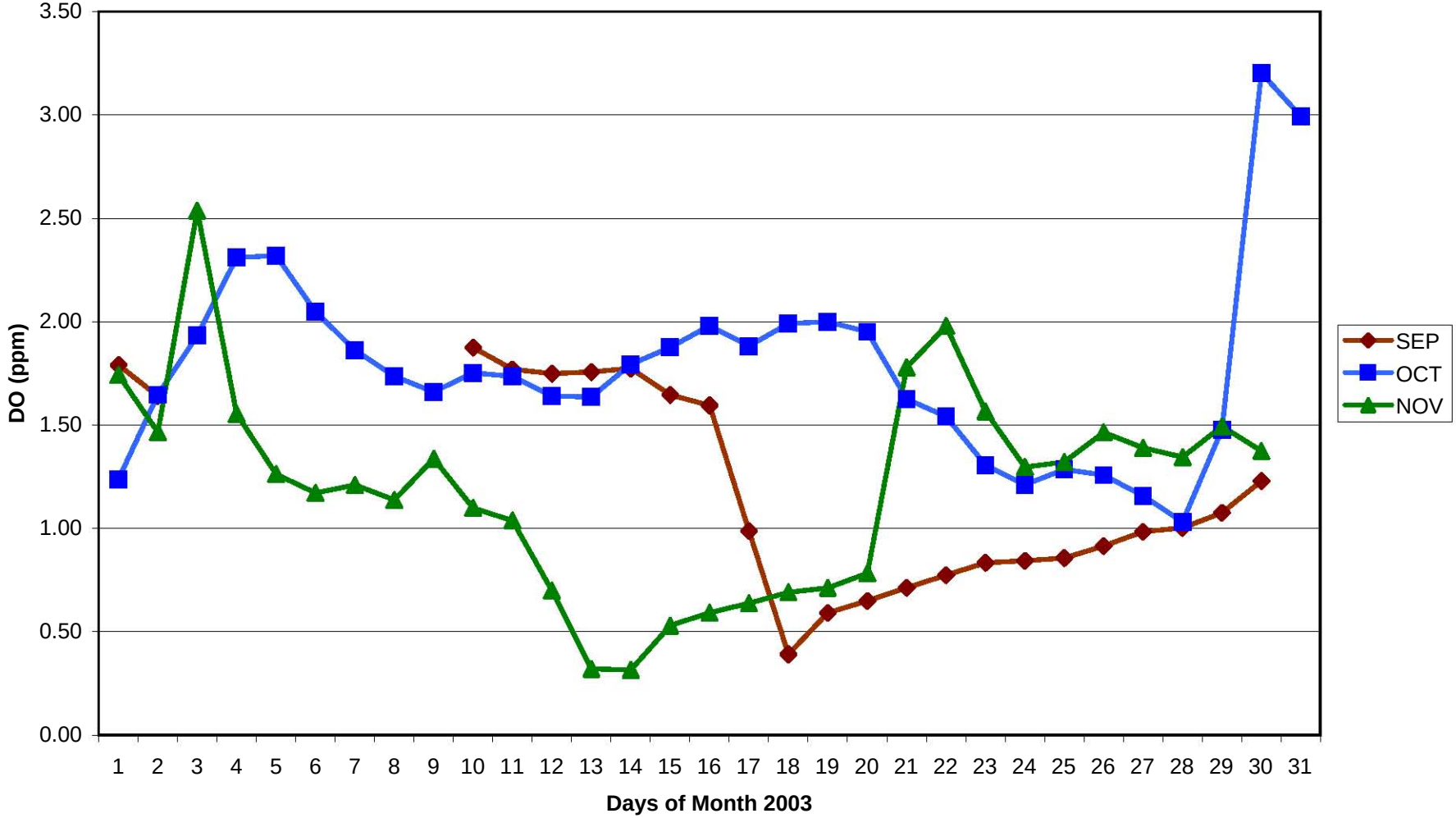
3.5 Bullfrog Eradication:
Bullfrogs are voracious feeders, and have been known to consume fry. This spring NAWS China Lake plans to conduct bullfrog eradication efforts. Two methods of eradication are planned. Small mesh traps will be set for a short amount of time to trap bullfrog tadpoles. The other method of eradication will be gigging. The process of gigging is conducted at night and involves a high-powered light spotlight, a small boat, and a gig. As the boat eases down the channel, the spotlight will light up the frog's eyes, blinding them, and allow the boat to come closer in order to gig them. The gigged bullfrogs will then be collected and disposed of properly.

APPENDIX A

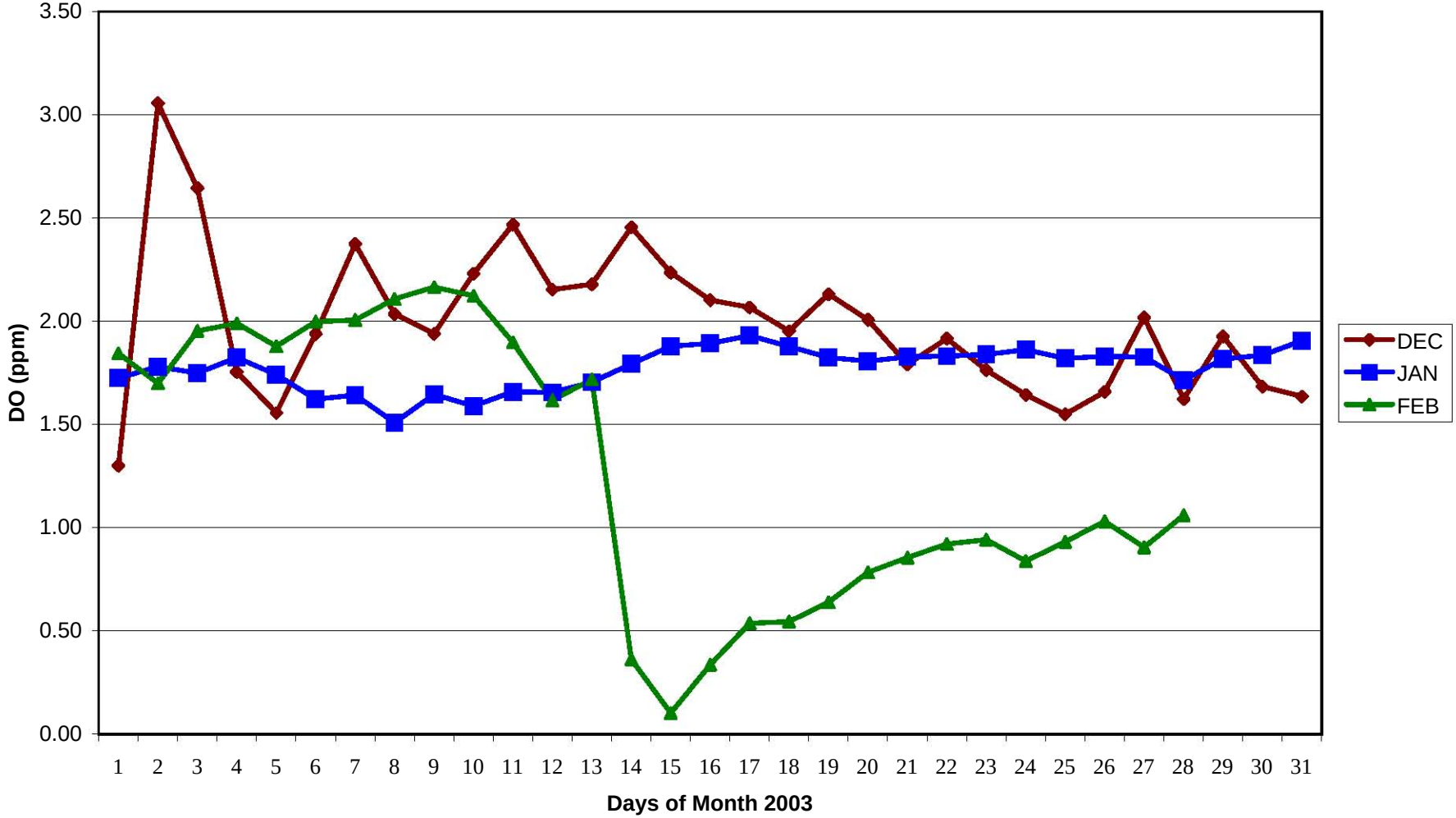
Chub Med Water Meter Data

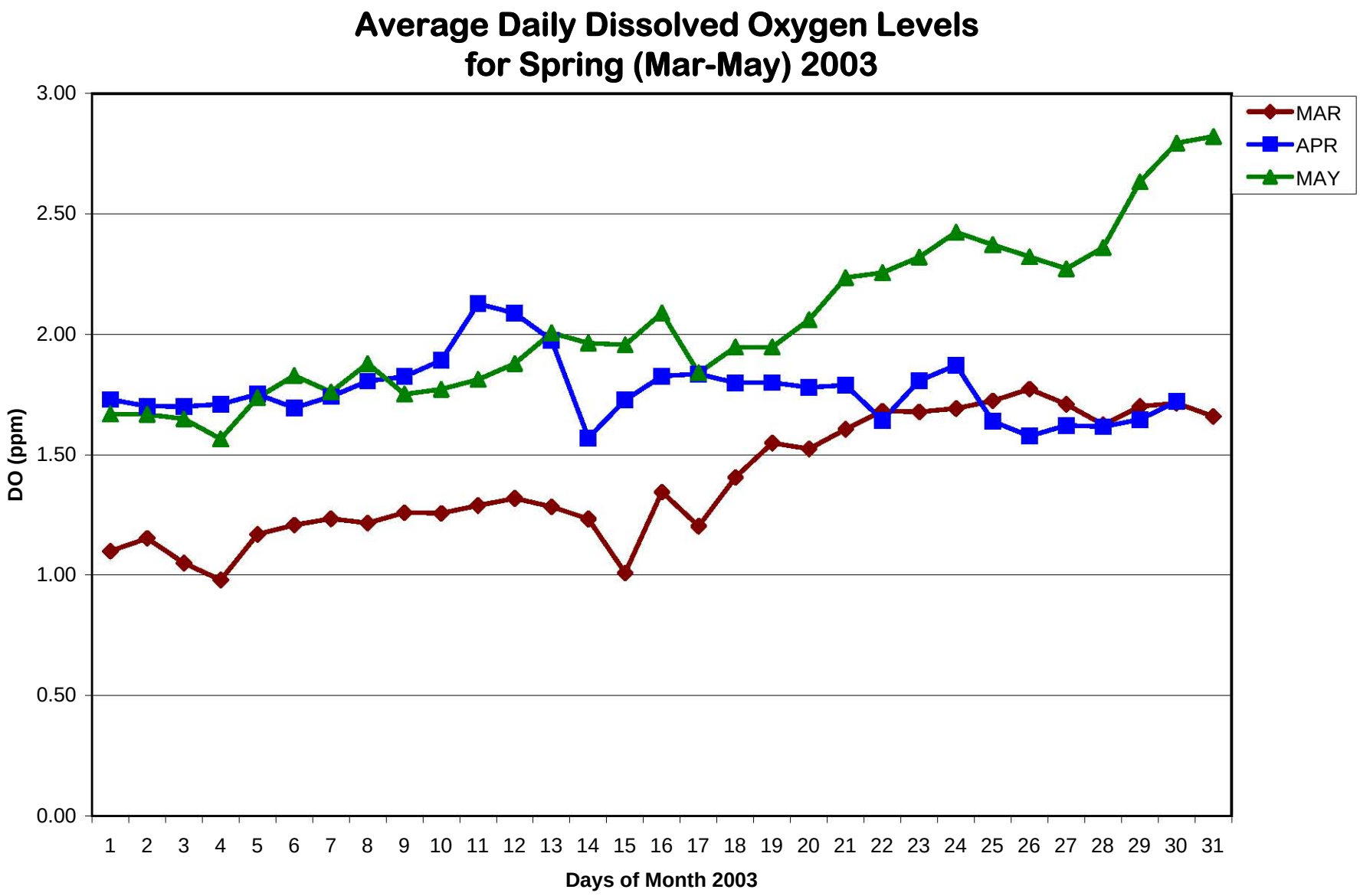

Average Monthly Dissolved Oxygen for 2003
Within the Chubmed Habitat
DO (ppm)
2.50
2.00
1.50
1.00
0.50
0.00
1.77
1.28
1.40
1.77
2.05
2.19
1.87
0.95
1.16
1.78
1.19
2.02
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2003
Average DO

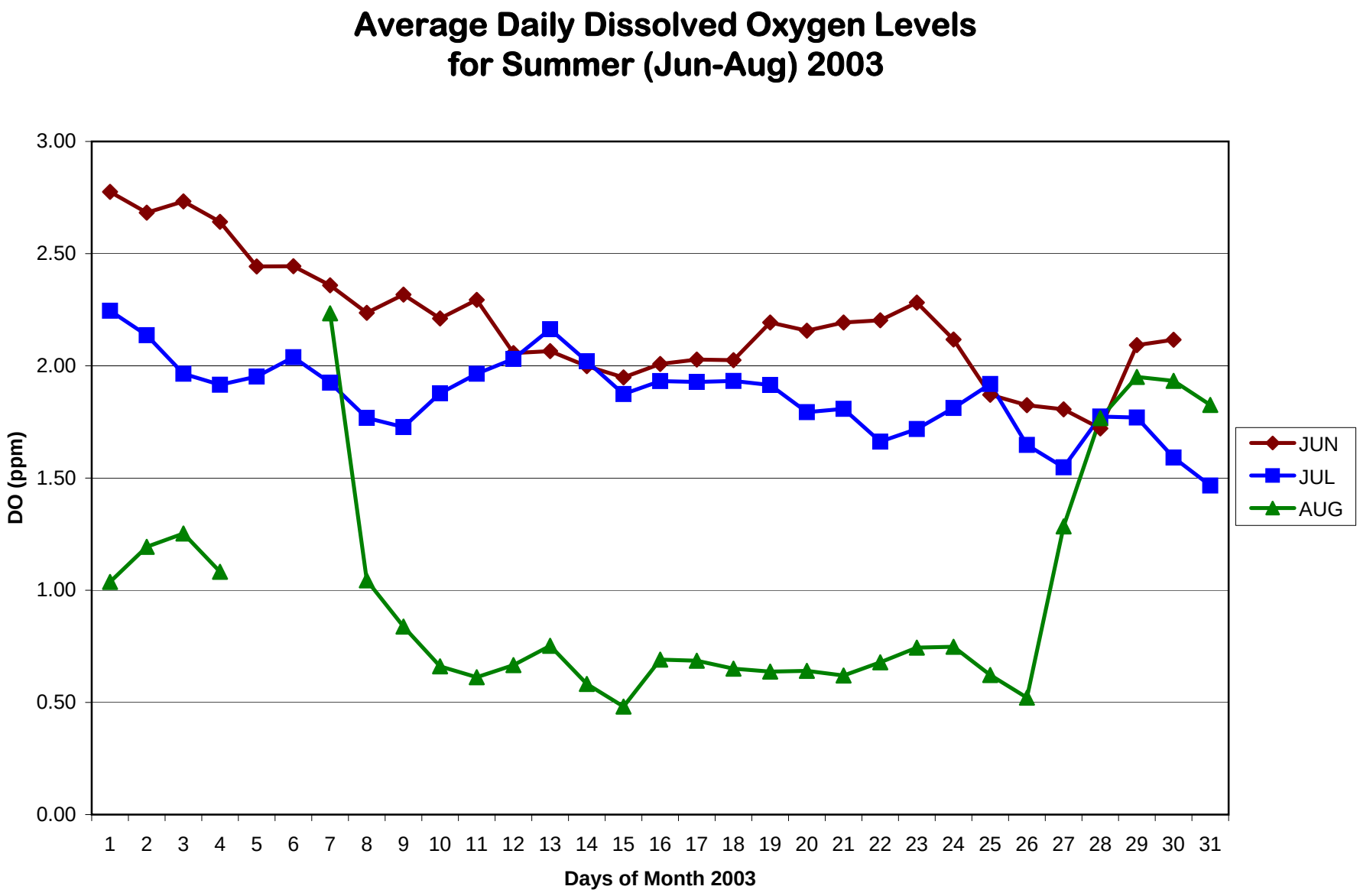
Average Daily Dissolved Oxygen Levels for Fall (Sep-Nov) 2003

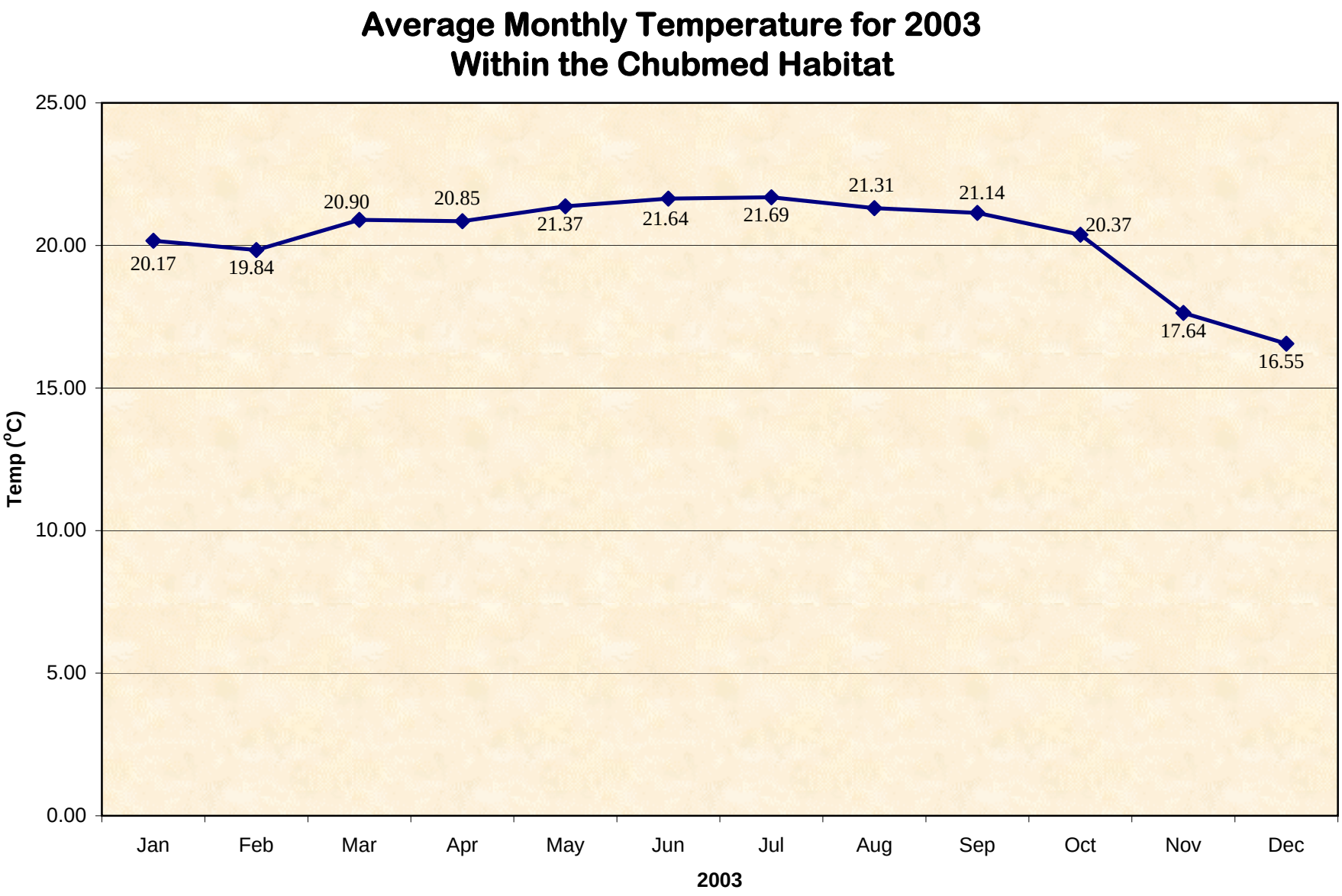


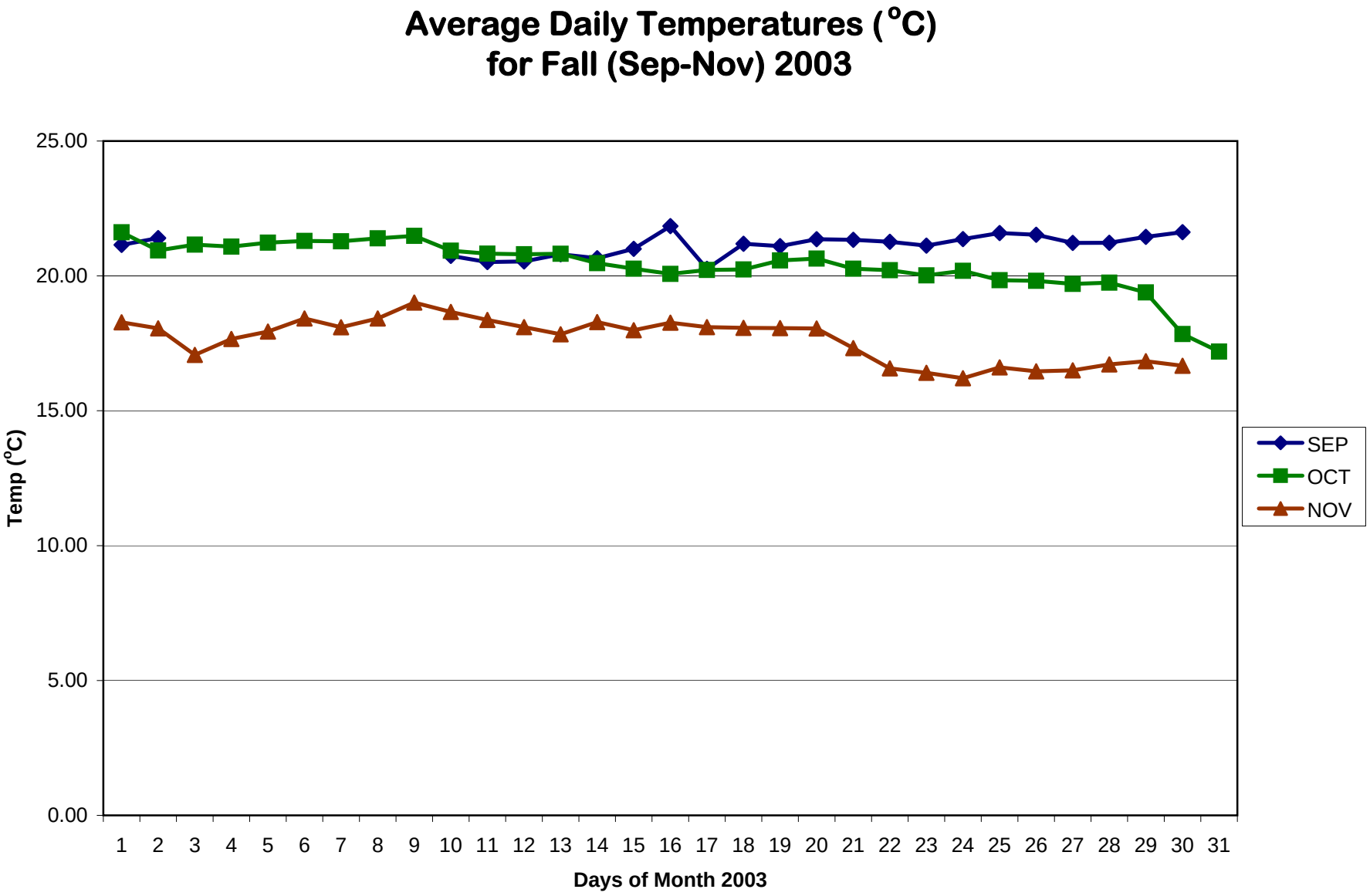
Average Daily Dissolved Oxygen through Winter (Dec-Feb) 2003

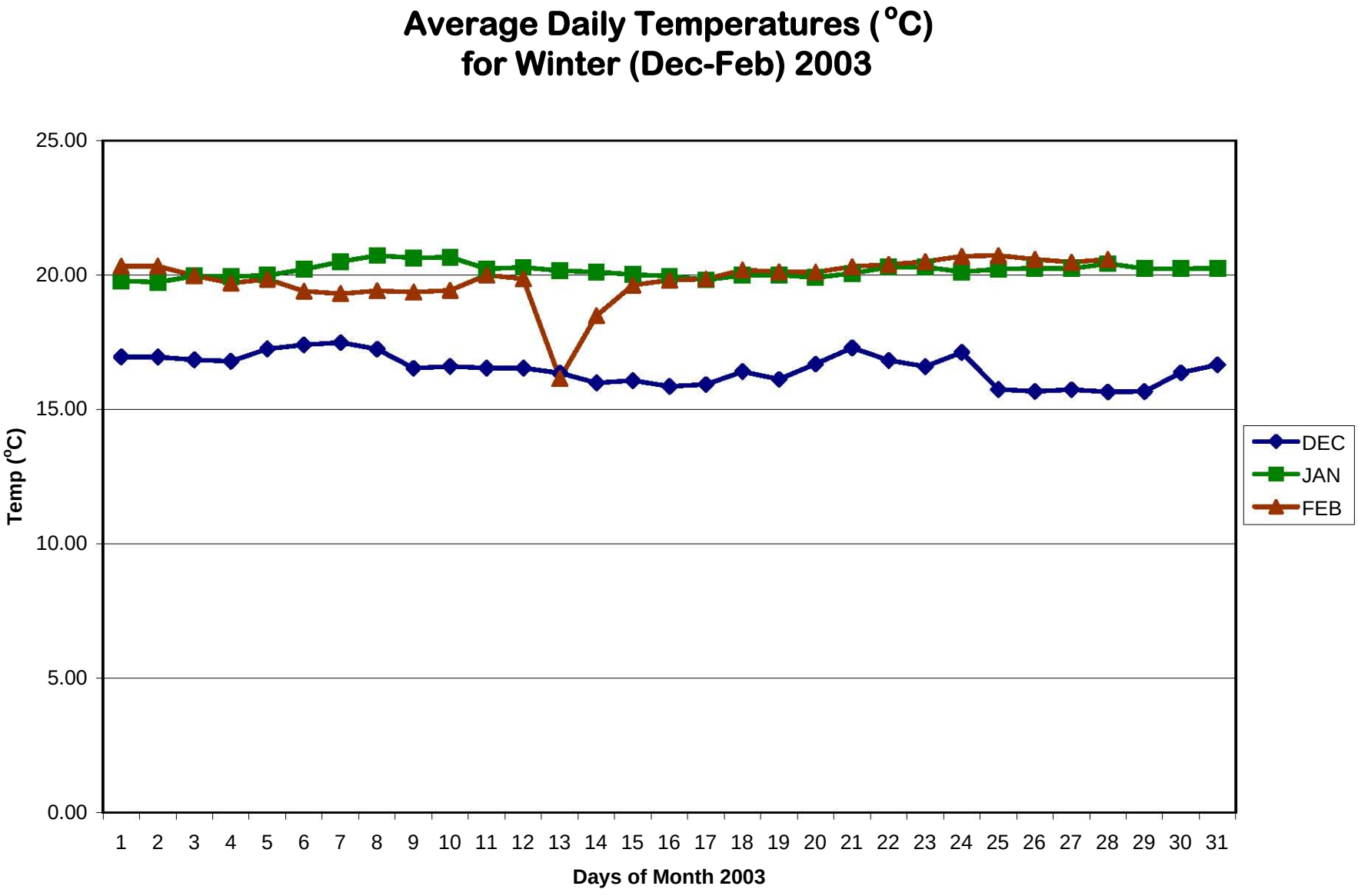


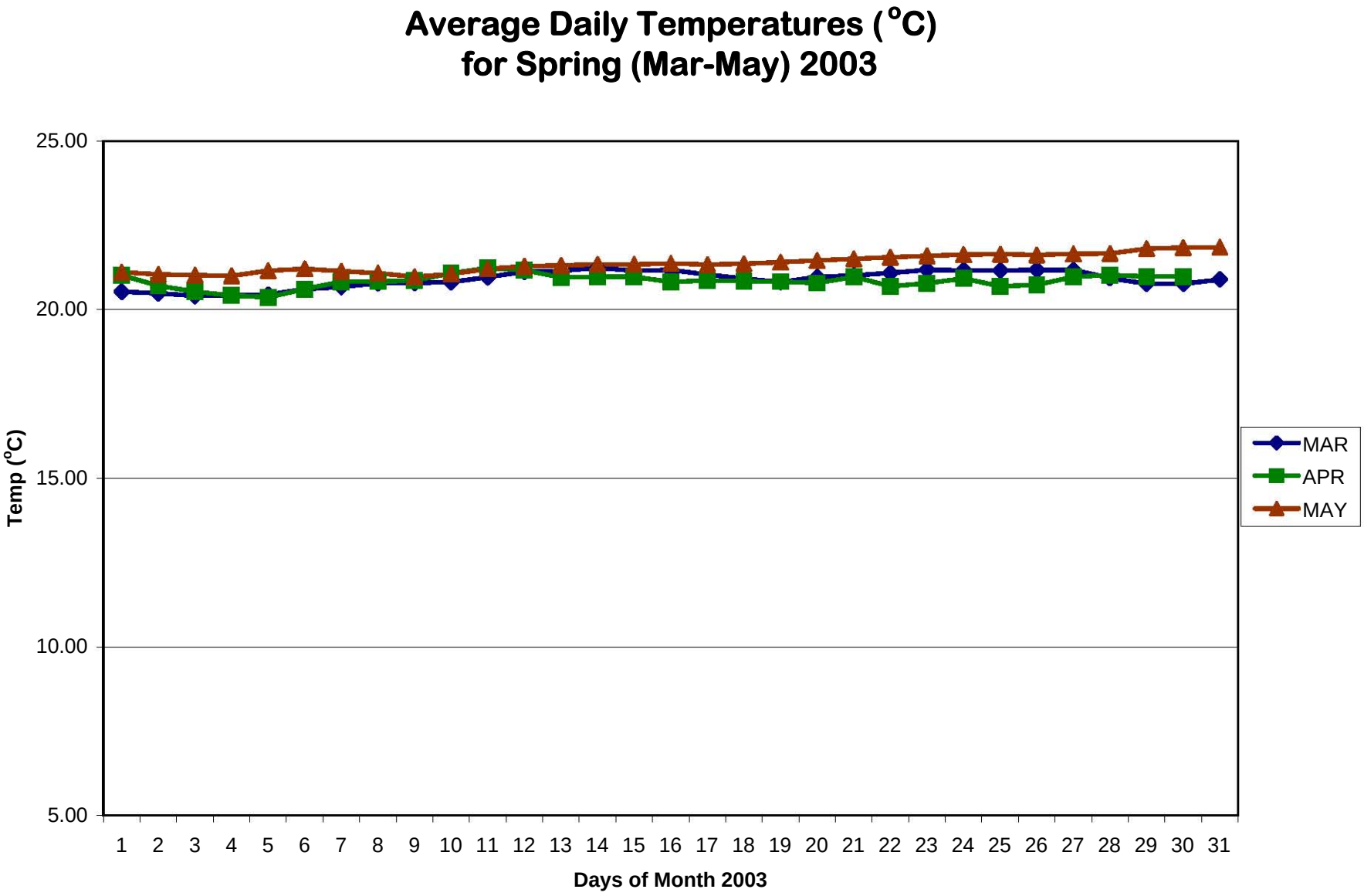

Average Daily Dissolved Oxygen Levels
for Spring (Mar-May) 2003
3.00
2.50
2.00
1.50
1.00
0.50
0.00
DO (ppm)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Days of Month 2003
MAR
APR
MAY

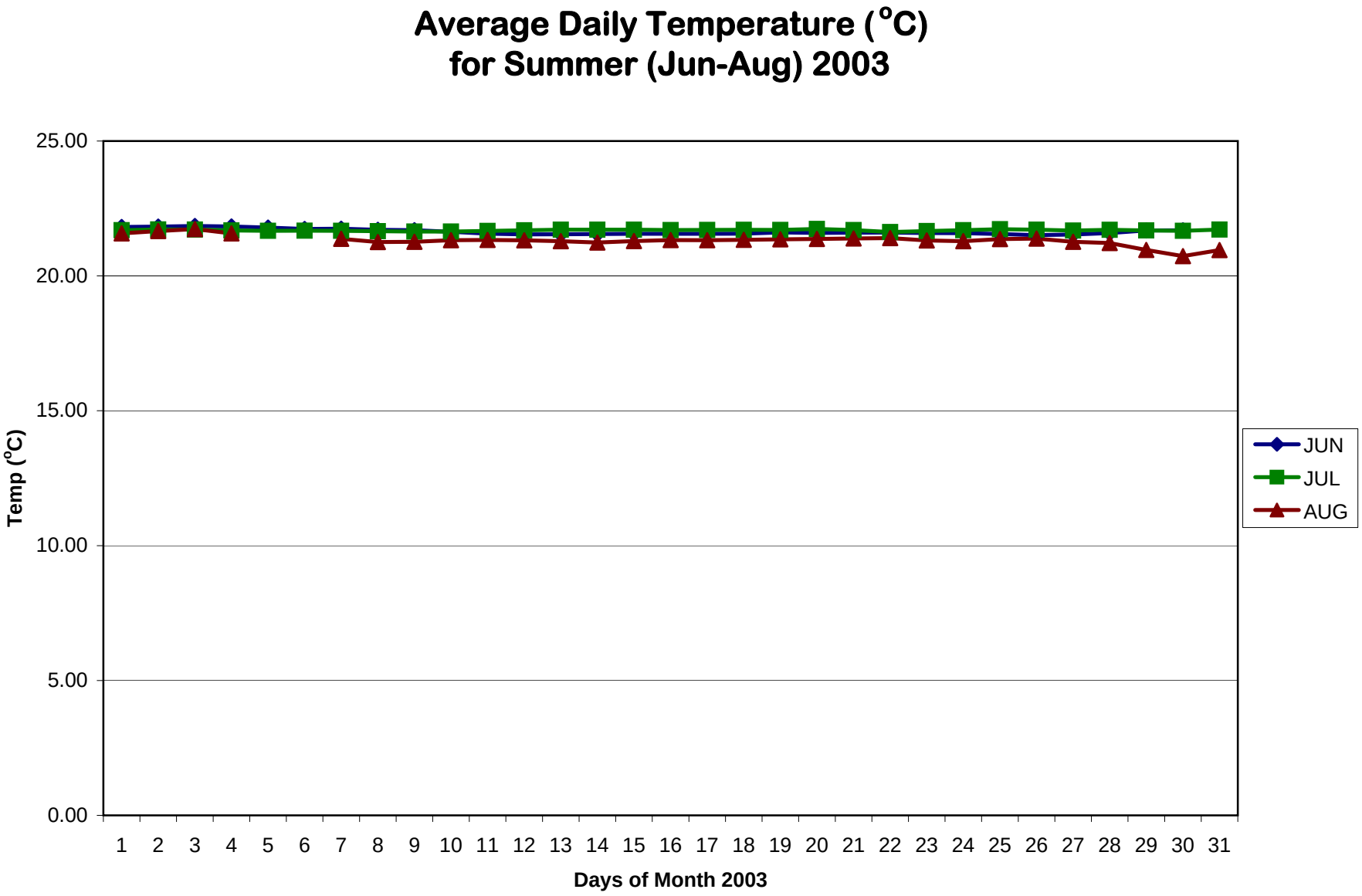

Average Daily Dissolved Oxygen Levels
for Summer (Jun-Aug) 2003
DO (ppm)
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Days of Month 2003
JUN
JUL
AUG


Average Monthly Temperature for 2003
Within the Chubmed Habitat
25.00
20.00
15.00
10.00
5.00
0.00
Temp (°C)
20.17
19.84
20.90
20.85
21.37
21.64
21.69
21.31
21.14
20.37
17.64
16.55
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2003


Average Daily Temperatures (°C)
for Fall (Sep-Nov) 2003
25.00
20.00
15.00
10.00
5.00
0.00
Temp (°C)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Days of Month 2003
SEP
OCT
NOV


Average Daily Temperatures (°C)
for Winter (Dec-Feb) 2003
25.00
20.00
15.00
10.00
5.00
0.00
Temp (°C)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Days of Month 2003
DEC
JAN
FEB


Average Daily Temperatures (°C)
for Spring (Mar-May) 2003
25.00
20.00
15.00
10.00
5.00
Temp (°C)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Days of Month 2003
MAR
APR
MAY


Average Daily Temperature (°C)
for Summer (Jun-Aug) 2003
25.00
20.00
15.00
10.00
5.00
0.00
Temp (°C)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
Days of Month 2003
JUN
JUL
AUG

APPENDIX B

Procedures

WATER METER DOWNLOAD PROCEDURES

Introduction:

Three Microsonde CS304 meters are located within the Lark Seep System. These meters are located on bridges over Chub Med, the Mystery Culvert, and G1 Channel (Figure 1). Microsonde CS304 meters collect water quality data 24 hours a day, using Greenspan software to record the data every 30 minutes. The meters have individual sensors that record pH, conductivity, dissolved oxygen, and temperature.

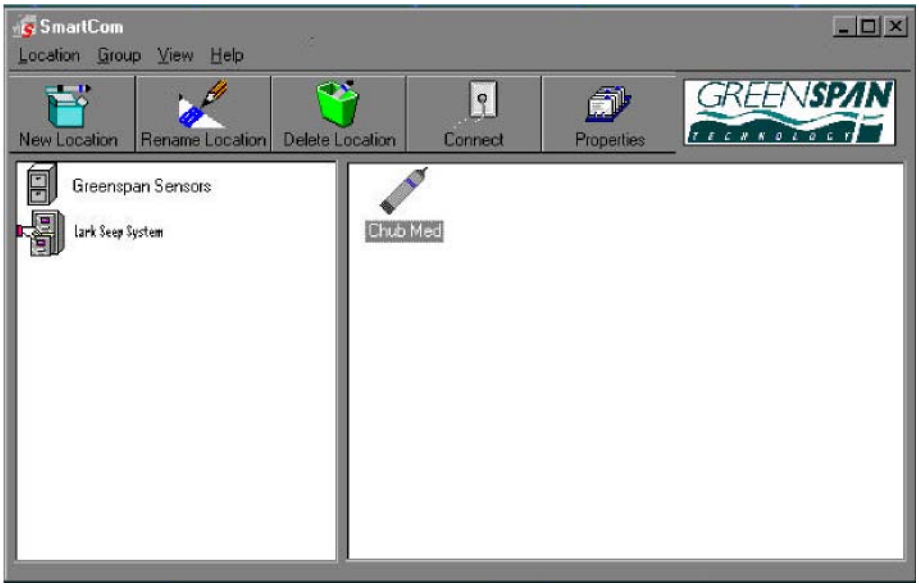
Although the data loggers will store data for a considerable period of time it is advisable that data be retrieved on a weekly or bi-weekly basis from the Greenspan CS304 water meters.

Data Downloading Procedures:

1. Remove the white protective box from the top of the battery and meter cables.

2. Connect the gray nine-pin connector to the back of the computer and the round connector to the meter cable and then power on the computer.

3. The software used to download the data stored by the meter is Smartcom and there is an icon on the desktop. When the Smartcom icon is double clicked the program will begin and the following window will open.



The left half of the window contains the meter groups and the right half contains the individual meters within the group. All meters monitored will be within the Lark Seep System Group.

4. Click on the Lark Seep Group and the meters will appear in the right side.

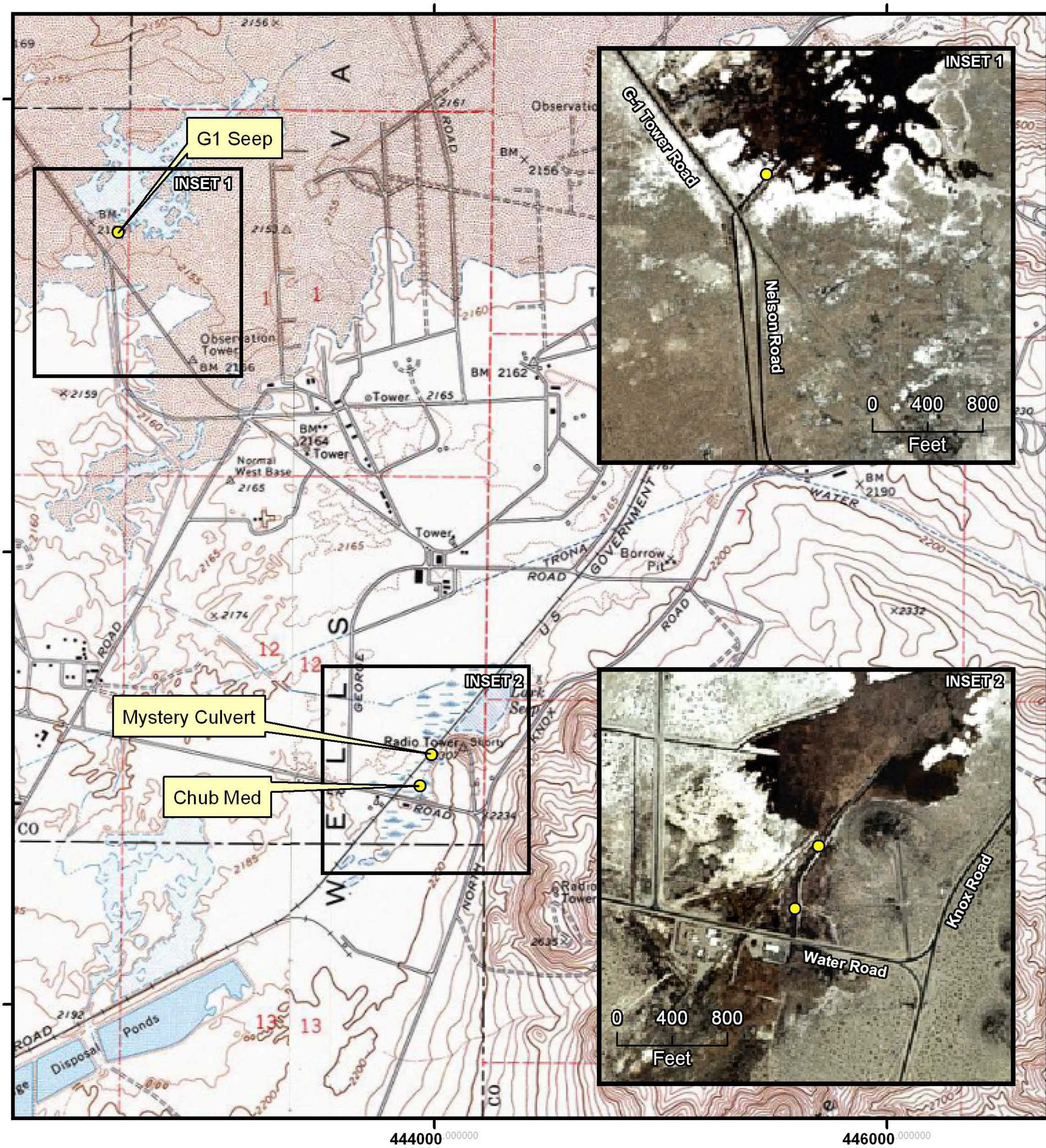


Figure 1: Water Meter Locations Within the Lark Seep System

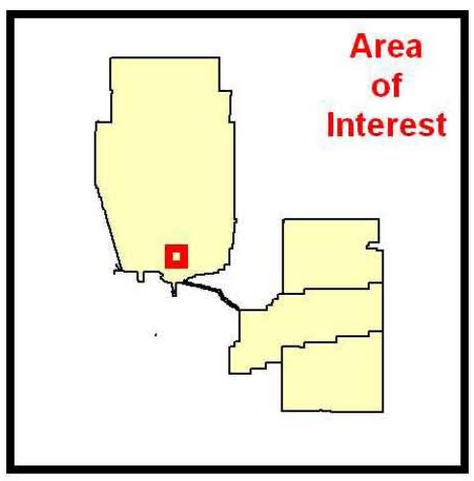
Water Meter

Feet 0 800 1,600 3,200

Grid: 2000-m
Scale: 1:24000
GCS: NAD 83 UTM Z11N
Base Map: USGS 7.5' (Topographic)

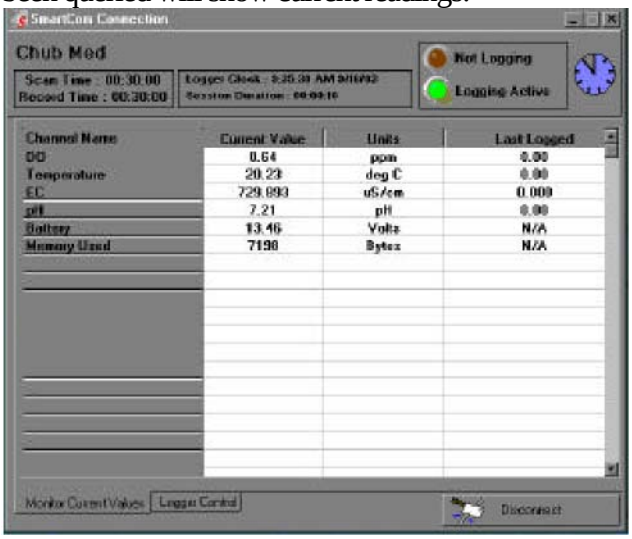
Daniel Zelko - Epsilon Systems Solutions, Inc. - 19 Nov. 2003 - /Projects/ESS/WaterM_LarkSeep.mxd

EPSILON Systems Solutions, Inc.

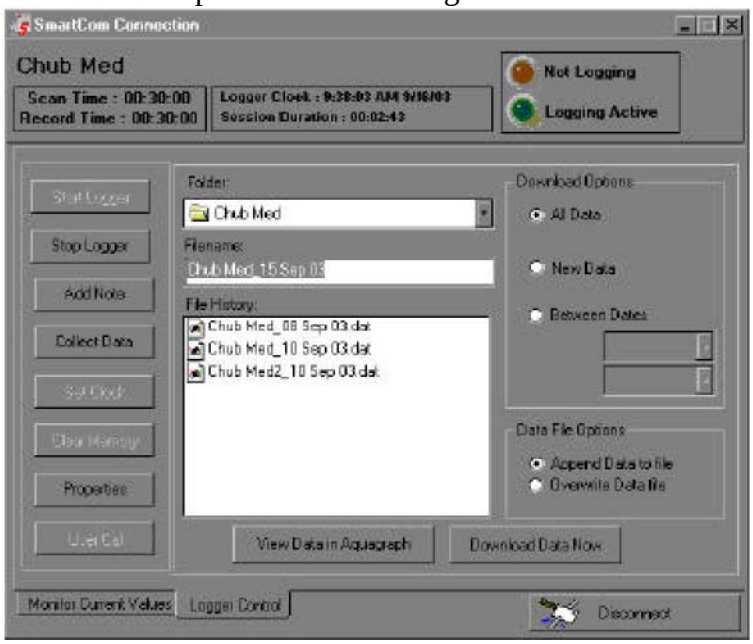


5. Click on the meter that is going to be downloaded and the menu options at the top of the window will change.

6. Click the **CONNECT** button. Various windows will appear informing you that the computer is trying to connect to the meter. Once the connection is established, the software will check all alarms ensuring data stability. The window that appears once all the data has been queried will show current readings.



7. Choose the **LOGGER CONTROL** tab at the bottom of the resultant window. A new window will open with buttons along the left side.



8. Click on the **COLLECT DATA** button. The right side of the window will display various saving options: All Data, Only New Data, and Data Between Specific Dates. The quickest and easiest option is to save the new data. The new data is the data that has been added to storage since the last download. All data is appended to a file. The file is usually named for you in the

middle section of the window. The naming convention for downloading files will be to name by month and year in the MMMYYYY format. Click on **DOWNLOAD DATA NOW** and the data will be copied from meter storage to the computer. Once the download is complete click on the **DISCONNECT** button at the bottom right side of the window. This will return control to the main window. Choose **EXIT** under the **FILE** menu.

9. The computer may now be powered off and the cables disconnected.

Data Processing Procedures:

Once the data has been downloaded, it will have to be processed by the complimentary software, Aquagraph. Go to the **START** menu and under **PROGRAMS** choose **Aquagraph.** The software will open a window with two buttons, choose the **Open Data File** button and a file browser window will open. The following folder order will find the data files:

PROGRAMS à SMARTCOM à LARK SEEP SYSTEM à (whichever file indicates the meter location)

Highlight or double click on the appropriate file and Aquagraph will open it in a spreadsheet format.

Once the data has been opened it must be exported so that it can be imported into an Excel spreadsheet. Choose the **FILE** menu and **EXPORT DATA FILE,** save the file as a comma separated type (.csv).

Once the export has been completed exit Aquagraph and open Excel. Within Excel open the file according to Excel instructions (remember it is a .csv type file so make sure that the type is All Files or .csv).

The data will come into Excel in a format that is difficult to read. The data will have to be cut and pasted into another Excel spreadsheet. The spreadsheet will encompass a year and the individual worksheets within the spreadsheet will span a seven-day period.

APPENDIX C

USFWS Biological Opinion
(1-8-87-F-39R)
as amended on 8 Aug 03

United States Department of the Interior

FISH AND WILDLIFE SERVICE

2493 Portola Road, Suite B
Ventura, California 93003

August 8, 2003

Carolyn A. Shepherd
Head, Environmental Planning and Management Department
Naval Air Weapons Station
1 Administration Circle
China Lake, California 93555-6100

In Reply, Refer To: PAS 592.637.801

Subject: Amendment to Biological Opinion 1-8-97-F-39R, Naval Air Weapons Station, China Lake, Kern County, California

Dear Ms. Shepherd:

This letter constitutes an amendment to the August 7, 1997, biological opinion (1-8-97-F-39R) on the maintenance of habitat for the federally endangered Mohave tui chub (*Gila bicolor mohavensis*). The U.S. Fish and Wildlife Service (Service) has received your letter of May 30, 2003, which requests our approval of a change in the period when vegetation can be removed from habitat that is occupied by the Mohave tui chub. On July 23, 2003, we received an electronic mail from Mr. Steve Pennix of your staff. His electronic mail asked that the proposed action in the subject biological opinion be amended to include a second, less invasive, method for controlling aquatic vegetation. Vegetation removal from water-filled channels on the Naval Air Weapons Station (NAWS) currently takes place according to terms and conditions contained within the biological opinion entitled *Reinitiation of Formal Consultation on the Removal of Aquatic Vegetation from Mohave Tui Chub Habitat on the Naval Air Weapons Station, China Lake, Kern County, California (1-8-97-F-39R)*.

Your December 17, 1996, request for consultation stated that removal of vegetation should be accomplished between October 1 and January 31 while water temperatures are cooler and Mohave tui chub are not reproducing. The removal of aquatic vegetation from overgrown channels on the NAWS involves the use of an earthmover or clamshell dredge mounted on a crane.

In your May 30 letter, NAWS staff requested we concur with your determination that modifying the period when vegetation removal activities occur on the NAWS is not likely to adversely affect this taxon, *i.e.*, that vegetation removal could begin on or after September 15 of each year instead of the October 1 date that is specified in the proposed action of the subject biological opinion. Your letter summarizes water temperature and dissolved oxygen data that were collected in the North Channel of the Lark Seep System during the last two weeks of September

and the first two weeks of October 2002. These data indicate there is no significant difference ($p<0.05$) in these environmental variables between these two sampling periods. You have therefore concluded that modifying the date of the initiation of cattail removal activities is not likely to create more severe environmental conditions for the Mohave tui chub because water temperatures and dissolved oxygen levels between September 15 and October 1 are essentially the same.

Mr. Pennix's electronic mail provided additional information on the ecology of Mohave tui chub that are present on the NAWS. Mr. Pennix notes that no rigorous studies have been conducted that would establish the actual spawning period for tui chub occurring on the NAWS. He summarized anecdotal observations on the spawning behavior of tui chub (*Gila bicolor* spp.) in the Mojave Desert which suggest that other chub taxa in the region are known to be extremely fecund and have a spawning season beginning in early spring. Previous trapping of Mohave tui chub on the NAWS in May or June occasionally resulted in the capture of fish containing eggs, while trapping in the early part of October 2002, did not result in the capture of any fish that expelled eggs when they were handled. Mr. Pennix also noted one publication indicating that Mojave tui chub have been recorded as spawning primarily from February through May. Therefore, your staff expects that vegetation removal activities during the last two weeks of September would have little or no affect on Mohave tui chub recruitment.

The July 23 electronic mail from Mr. Pennix included a proposal to control the growth of cattails (*Typha* sp.) using a Jensen Lake Mower. The use of the Jensen Lake Mower would be limited to the North Road channel, and involve an area 300-feet long by approximately 15-feet wide. The mower would be attached to the bow of a small boat. The boat will be slowly towed along the channel by two people walking atop opposites sides of the channel. No gas or electric motors will be used to power the boat. An operator in the boat would control the 4-foot wide serrated crosscutting horizontal blades on the mower in a manner that cuts cattails at a depth of two feet below the water surface. A 50-foot swath of cattails will be clipped at a time. Use of the boat and cutter will be limited to channels on the NAWS, and transfer and off-site re-use of the equipment is not planned. The clipped floating cattails will be collected in the channel with a grass rake, pulled into the boat, trucked offsite, and disposed of in an upland area. If difficulties develop as the excess vegetation is removed, further clipping of cattails will cease and NAWS staff will contact the Service to determine if the use of the Jensen Lake Mower should proceed.

The removal of cattails from a 300-foot length of channel using the Jensen Lake Mower will facilitate an evaluation as to whether the mower is a viable tool for removing and eliminating cattails from a larger area of Mohave tui chub habitat on the NAWS. Your staff does not believe that the use of the Jensen Lake Mower will create additional adverse effects beyond those already caused by the annual use of the earthmover or clamshell dredge which is authorized under the subject biological opinion. They also believe the use

of the mower will reduce the adverse effects that are currently allowed under the subject biological opinion, *e.g.*, increases in water

turbidity in the fish's habitat will be greatly reduced and impacts to the bottom substrate will be eliminated.

After reviewing the information contained within your May 30 letter and Mr. Pennix's July 23 electronic mail, we agree that a change in the start date of vegetation control activities on the NAWS from October 1 to September 15 will not change the scope or intent, or alter the net effect or increase the level of take on the Mohave tui chub from that analyzed under the Service's biological opinion 1-8-97-F-39R. Accordingly, the following minimization measure is substituted for minimization measure 1 found in the "Description of the Proposed Action" section of biological opinion 1-8-97-F-39R:

1. To implement, with one modification, the terms and conditions from the previous biological opinion issued for channel clearing (1-6-90-F-40). The NAWS proposes to modify term and condition 1C of the 1-6-90-F-40 biological opinion to permit removal of aquatic vegetation between <u>September 15</u> and January 31.

The change from the original measure in the biological opinion is underlined, *i.e.*, the date has been changed from October 1 to September 15.

The proposed action in the subject biological opinion is hereby amended to include the use of the Jensen Lake Mower along a 300-foot long portion of the North Road channel. The use of this device to clear cattails will conform to the methods described above. We concur with your determination that the use of the Jensen Lake Mower is not likely to alter the net effect to the species or increase the level of take of fish from that analyzed under the Service's biological opinion 1-8-97-F-39R.

If you have questions of concerns regarding this letter, please call Douglas Threloff of my staff at (760) 644-1766

Sincerely,

Catrina Martin
Deputy Field Supervisor