Rampart Rapids Fall Catch Per Unit Effort Video Monitoring, 2002

Using a Fishwheel on the Yukon River, Alaska

By Stan Zuray

November 2002

Final Report to the Yukon River Panel, Anchorage, Alaska

Rampart-Rapids Fall Catch-Per-Unit-Effort Video Monitoring – 2002

Using a Fishwheel on the Yukon River, Alaska

Stan Zuray
Box 172
Tanana, Alaska
Tel: (907) 366-7114
Fax: (907) 366-7195
stanzuray@netscape.net

November 2002

Key words: catch-per-unit-effort, stored video images, Yukon River, fall chum salmon, fishwheel, computer

The correct citation for this report is:
Zuray, S., 2002b. Rampart-Rapids Fall Catch-Per-Unit-Effort Video Monitoring, 2002 - Using a Fishwheel on the Yukon River, Alaska. A final report to the Yukon River Panel, Anchorage, Alaska.

Cover: Two-basket fishwheel, equipped with netting sides, water generator, equipment enclosure, microwave transmitter and video chute. Two subsistence fishwheels are upriver.

Author

Stan Zuray has been a fisherman and trapper in the Tanana area since 1973. During the last seven years he has had a contract with the U. S. Fish and Wildlife Office in Fairbanks to run fishwheels for their fall chum salmon tagging project at the Rampart Rapids.

Sponsorship

This project was funded by a grant from the U.S. Fish and Wildlife Service through the Restoration and Enhancement Fund provided through the U.S. Salmon Treaty Negotiations.

U.S. Fish and Wildlife Office, Fairbanks continues to provide electronic and computer set up help and consultation in computer operation and statistics.

Tanana Tribal Council provides fax, copying and message services for the project.

Acknowledgments

Thanks to fisheries biologist Dave Daum (U. S. Fish and Wildlife Office, Fairbanks) who provided invaluable preseason computer support, in season help and assessment and post season analysis.

Thanks to fisheries biologist Tevis Underwood (U. S. Fish and Wildlife Office, Fairbanks) for his continued help and use of his “Rapids” camp facilities. Also for the help of his technical crew in camp breakdown work each year.

Table of Contents

.

List of Figures

List of Tables

Introduction

Video monitoring of fall chum salmon (Oncorhynchus keta) passage in the middle Yukon River began in 1999 at Rampart Rapids (Rapids, 730 miles upstream from the Yukon River mouth). Future data on chum salmon and the numerous other fish species (many important subsistence resources) caught at Rapids will help build a long-term population trend data base that will increase in value as the project continues. A continuous funding source has not been found however, that will finance this project over the long-term.

The project site at the Rapids has probably been a subsistence fishwheel site since fishwheels came to the Yukon (around 1900). Traditionally, the particular bend in the river where the site is located has always been well known for its ability to consistently produce good catches of fish, chinook O.tshawytscha as well as chum salmon, whether the water was high or low. Because of the unique currents in the Rapids, fishwheels are capable of being run there even during the spring drift that happens at the same time as the chinook salmon run. Traditionally, people would travel to the Rapids area to spend their summers because of these qualities. Even today it is one of the most densely populated fish camp areas on the Yukon River.

Fishwheels are commonly used as a capture method for management and research activities in the Yukon River drainage. Specifically, fishwheels have provided catch per unit effort (CPUE) data at various locations to fishery managers. Also, fishwheels are used to capture and hold fish for tagging studies. The majority of these fishwheels use live boxes to store fish until the researchers or contractors process and release the fish. Crowding and holding times greater than four hours are common and a growing body of data suggests that delayed mortality and reduced traveling rates are associated with holding, crowding, and/or repeated re-capture (Underwood et al. in prep: (Underwood, U.S. Fish and Wildlife Service, Fairbanks, personal communication): (Eiler, National Marine Fisheries Service, personal communication).

From 1996 to 2001 (present) the site has been used to run fishwheels for the Rampart Rapids fall chum salmon tagging project (Underwood et al. 2000). During these six years the site fishwheel operated without any down days or days when data were compromised. In 1996, 1998 and 1999 a fall chum radio-tagging project was also conducted from this site (J. Eiler, National Marine Fisheries Service, personal communication). During the first year of operation the radio tag project became aware of a possible problem with live box held chum salmon. This was studied in 1998 and 1999 and results (not yet published) showed a significant negative effect on fish held in the live box for 4 to 6 hour (J. Eiler, personal communications). A further indication of a possible problem with live boxes was a 1998 radio-tagging project done on sheefish showing excellent results from fish tagged and immediately released with no holding time in the live box (Brown, 2000).

In 1999 the fishwheel operator at Rapids was supplied with a satellite phone from the U.S. Fish and Wildlife (USFWS), Fisheries Resources Office in Fairbanks and called in daily subsistence chum and chinook salmon CPUE data to the Alaska Department of Fish and Game (ADF&G). 1n the fall of 1999 a development project was undertaken at this site to address the increasing concerns over live box held fish and come up with an alternative method of monitoring catch using video (Zuray and Underwood 1999). Video technology, as an alternative to live boxes, avoids all of the handling and live box crowding issues by eliminating the use of live boxes altogether. Video systems have been used in counting windows at dams in the Columbia River basin for several years (Hatch et al. 1998). These systems have proved to be efficient and able to provide accurate counts. They have however been designed for use in developed areas where standard power is available and environmental variables are easily controlled. In transferring this technology to a fishwheel on the Yukon River it was necessary to deal with many problems that did not exist in prior applications of this technology. A video capture system was developed that had low DC power requirements. The system used an analog CCD camera, mounted above the fish wheel chute. As fish slide down the fishwheel chute, they were recorded to a time-lapse VCR in 12-hour recording mode. The fish images were then extracted from the VCR tape and digitized using Salmonsoft video capture software. Fish were then tallied by species and CPUE data were generated. (see the methods section of Zuray and Underwood, 1999 for a detailed description of the video methods). Also, a specially built fishwheel was used having many features designed to reduce possible injury to fish. The USFWS, Fisheries Resource Office in Fairbanks was directly involved in the development and support of the Rapids CPUE video project in 1999.

In 2000 a chinook and fall chum salmon CPUE video project was funded at the Rapids site by grants from the USFWS through the Restoration and Enhancement Fund (Zuray, 2000a and Zuray, Fall 2000b). Also, catches of sheefish, humpback whitefish, broad whitefish and cisco spp. were monitored. The chinook and fall chum video projects have been able to run both years without any down days or days when data were compromised. They provided data without any live box held fish being released back into the river. In 2001 and 2002 operations of the chinook video project took place funded by grants from the USFWS, Federal Office of Subsistence Management, Federal Subsistence Fishery Monitoring Program (Zuray, 2001)(Zuray, 2002).

In 2001 and 2002 operation of the fall chum video project took place funded by grants from the USFWS through the U.S. Salmon Treaty Negotiations Restoration and Enhancement Fund. The fall chum video project is a mating of the need for run timing and assessment data and the use of video capture as a means of producing data in a way that is much less harmful to fish. Test fish wheels targeting upper Yukon fall chum stocks have been discontinued near Tanana and the ADF&G and the USFWS have recommended collection of this CPUE project at the Rapids site.

This report will cover any major developmental changes and all major equipment used in the 2002 project, the field video taping procedures, and computer image capture methods. Data will be described, counts compared, and a comparison of the data provided. Aspects of the project that may help someone implement their own project and recommendations for further work are discussed that shed light on the practical aspects of making a video project work.

Objectives

1. To provide continued video CPUE data collection on fall chum salmon.
2. To provide continued video CPUE data collection on migratory whitefish.

Study Area

The project was conducted on a fishwheel 40 miles upriver from the village of Tanana at an area locally known as "The Rapids", a narrow canyon 1176 km (730 miles) from the mouth of the Yukon River. Traditionally and at the present time it is an area known for its abundance of a wide variety of fish species. This condition exists because of the fast currents and steep banks that force fish to migrate through the area relatively concentrated and close to shore.

Methods

Fishwheel

A two-basket fish wheel equipped with a video capture system was used to count fall chum salmon and other species from August 1st to September 19th. Effort was taken so the site of the project was consistent in operation to other years. The fishwheel rotation speed, the baskets dip depth, distance from the basket to river bottom, and length of the lead fence were kept similar. Sonar readings were used to improve the consistent positioning of the wheel relative to the migrating fish. Basket width is kept at 10 feet and dip is kept around 13 feet. Nylon seine netting was installed on the sides of the baskets to minimize injury to the fish as they were lifted clear of the water. Plastic coated mesh was in place on the bed or sliding portion of the baskets for "fish friendly" operation. Holding boxes that were used for subsistence by the operator and as a means of catching fish for research activities that the project supports are eight feet long, four feet deep and two and one half feet wide.

The date this project used for the official fall chum salmon arrival in 2002 was July 26th (TEK Fall Chum Arrival Date). Traditional ecological knowledge derived from elders in this area is used to determine arrival time. This is different than the set date used each year by Federal and State managers. The arrival of fall chum salmon is determined by viewing the flesh of the fish as they are cut in the subsistence fishery. Each day the percent of salmon having bright red color in the flesh is recorded. When the percentage reaches 50% it is considered that the fall chum run is solidly underway. This method of thinking is prevalent in the subsistence fishery of this area and is used in place of a set date.

The operations of the chinook video project had just ended on July 31ST and no break in data collection happened between that project and the start of the fall chum video project. Official start up date for the project is August 1. The proposed schedule for running is 24 hours per day (minus amount that may be needed for normal maintenance, data transfer, etc. each day). Project runs 6 days per week (see below). Project shut down coincides with the declining numbers of the last fall chum pulse (Sept. 15 – Sept 25). Reasons for schedule are as follows:

a. 24 hours sampling would increase the current amount of data collection time and be in line with recommendations from the ADF&G for operation of the Rapids fall chum CPUE project.

b. The logistics of one person running a site 40-miles from the nearest town necessitate one day a week being needed for a supply trip to Tanana and occasional equipment repairs or changes. As demonstrated during the chinook and fall chum projects in 2000, 2001 and 2002, data are often collected on these off days when trips or repairs are not needed.

Project Specifications

This is a new section added this year. The object is to provide specifications on fishwheel components and operation so future year's CPUE results can be as comparable as possible. Changes in some specifications could easily make these comparisons meaningless. Because of shifting silts and-or changing sites frequently, some projects are not able to collect data consistently from one year to the next. The Rapids has a hard rock bottom and the same site can be used each year. The project specifics listed below should be kept as consistent as possible each year.

Project Specifications:

1. Basket dip (amount of basket in water when vertical) is 13 feet (12 ½ to 13 ½).
2. Width of basket (outside to outside) is 10 feet.
3. Lead fence length is 20 feet.
4. Wheel is two-basket design with a basket side height on the lead facing side of 5 feet
5. A multiple beam (6), down looking sonar is used in season to slightly adjust fish wheel location, keeping the concentration of migrating salmon centered in line with the inside logs of the fishwheel raft. The size of the fishwheel was made to fit this specific spot. After many years of using the sonar in conjunction with this size fish wheel, the wheel seems to normally center itself over the concentration of passing fish when these operational specifications are followed. This appears to be especially true of fall chum salmon, which prefer a very consistent depth range to run at.
6. Wheel baskets are always run between one and 1.5 feet off bottom (hitting the rocky bottom can be disastrous).
7. Basket rotation speed is approximately one to 1.5 turns per minute (this slow speed is part of the fish friendly operation).

Video System

The video system used in 2001 consisted of a color CCD camera mounted above the fish wheel chute and directly connected to a laptop computer through a video capture card. After the fish wheel captures fish, they travel down a chute, are video recorded, and then re-enter the river. A time-lapse VCR is linked to the system for video recording backup. Twelve-volt batteries power the whole system. During daytime operation, a water-wheel generator charges the batteries. At night, lights necessitate the use of a small generator.

This system differed substantially from what was used in 1999 and 2000. In these years the camera was attached directly to the time-lapse VCR using 12-hour recording mode. These tapes were taken back to camp and run through a capture program (Salmonsoft Vcap 1.07) that extracted the video frames that contained fish into digital AVI format files. This process took two hours per 12-hour tape. The software program pulled the fish images out of the VCR tape with a "luminescence trigger" that used the change in pixel brightness between the background and the passing fish image. The system worked fairly well as long as any sources of strong shadow and light was eliminated from the viewing area. The major limitations of this method were: 1) the frame rate was limited to 5 frames per sec, 2) camera positioning was limited by the background (no shadows), 3) the system could only be run for 12 hour periods, and 4) VCR tapes would take an additional two hours of processing before digital files could be counted for fish.

In 2001, Dave Daum, USFWS, Fairbanks Fishery Resources Office, developed a new system that eliminated the past limitations of the system. A camera was mounted directly to a laptop computer on the fishwheel. Then a new re-designed version of Salmonsoft software (funded by USFWS that use electronic triggers to initiate capture of fish images as they slide down the fishwheel chute. A lightweight door was installed at the bottom of the chute with a magnetic switch attached. When a fish exiting the chute opened the door, a signal was sent to the computer. Frame rate and numbers of frames captured before and after the triggering event are controlled by software so the limitations of using time-lapse tapes were eliminated. Since the time-lapse VCR was still linked to the camera, any failure of the magnetic switch would be "backed up" on tape. Every day, the video data was downloaded off the fishwheel computer using a 1GB IBM, micro-drive and brought back to camp. A plywood structure and stove was constructed and set up to house the equipment in camp.

The same system was deployed in 2002. Here is a list of video procedures followed at the fishwheel. Start up procedures are normally used once a week unless the wheel needs to be stopped for repairs:

Start up

Arrival at the fishwheel - make sure wheel is adjusted for running (see above section on Project Specifications).

Switch on power to water generator and lower into water. Turn on fishwheel.

Open electronics cabinet, turn on DC power from batteries, and turn on VCR and laptop.

Check laptop monitor to make sure camera is on, in focus and positioned (rarely changes).

Wipe window clean on camera case (splash marks) and clean chute background (for nice pictures).

Start recording VCR tape. Turn on computer capture program.

Each Morning

Remove VCR tape and turn off VCR (only run at night for 12 hours).

Transfer data files from hard drive to portable microdrive.

Fishwheel is adjusted to water depth while running whenever needed.

To shut down

Shut down computer. Turn off main DC power switch.

Lift water generator out of water and turn off DC current to water generator.

(Normally one data retrieval trip was made in morning, one fishwheel check made in afternoon and lastly an evening trip made to start the VCR).

Fish Counting

In 1999 and 2000 time-lapse VCR 12-hour tapes were brought back to camp and run through Salmonsoft's "luminescence" program to digitize the fish images to electronic video format (avi). This process took two hours. Then avi files were viewed through a Windows media player and hand-tallied. This method was un-adjustable as to scroll speed of viewing video and all numbers of fish by species and sample times had to be entered into the data base by hand.

In 2001, an electronic tally system was developed that would facilitate rapid counting and calculating of CPUE data by fish species. This new video counting system, Salmonsoft capture review program, (funded by USFWS) allowed tallying of individual fish species using a computer keyboard. Images could be reviewed at user-defined speeds and played forward or reverse for review. Dave Daum, USFWS, did considerable Beta testing of the software, so a finished product would be available for the beginning of the 2001 season. After fish were tallied on the computer, numbers and times were entered into an Excel spreadsheet, which calculated 24-hour CPUE by day. These daily counts and CPUE calculations were then called into ADF&G using a satellite phone. Usually within a couple hours after retrieval of the data from the fishwheel, the call could be made to the fishery manager. All avi files and Excel spreadsheets were backed up on compact discs daily. 12 hr. VCR tape recordings were collected about twice a week. The primary purpose of the tape recordings was to provide data for in-season evaluation of the video system and post-season assessment. The project in 2002 used this tally system throughout the season

Assessment of Capture Program

As a final assessment, segments of original VCR tapes were viewed and compared to the corresponding video capture files generated from the magnetic switch video system. The original VCR tapes contain all fish that pass through the chute, so assessing how many fish, if any, were missed by the program was a fairly straightforward process although rather tedious and boring. Selection of assessment samples was two-part. 1. One day each week throughout the season was selected. 2. The first six hours or the first 50 fish on each tape were selected to review (based on workload in reviewing that much material).

The process was as follows:

1. The VCR tape for a particular day was put in the VCR and played into a computer software program called Win TV that simply opened up a window on the monitor for viewing. This window was moved onto one half of the monitor screen.

2. On the other half of the monitors screen the AVI file made by the fishwheel laptop/switch program was opened using Salmonsoft review program or the Windows 98 default video viewer found in Windows Explorer.

3. Both viewing samples were set at the beginning of the assessment sample period. The regular VCR controls on the VCR and remote were used for viewing the VCR tape and the computer mouse and keyboard forward and reverse features were used for viewing the AVI file from this point on.

4. The AVI file was advanced to the first fish, stopped and the time stamp noted.

5. The VCR tape was then run forward until a fish appeared and then was paused.

6. If all went well the VCR frame fish and the AVI file fish should be the same and have corresponding times. What was looked for was a fish that was on the VCR tape and not in the AVI file. If one were found that would signify a miss by the laptop/switch program.

7. Each fish reviewed on the VCR tape was counted on a multiple tally denominator.

8. Misses are recorded in the project workbook in case further study is needed to see why the error occurred. Most of the time the reason was apparent.

9. The AVI file was advanced to the next fish frame and the process repeated itself.

10. After an assessment selection went through this process the AVI file was then opened in Salmonsoft review program and the AVI file counted and compared to the VCR tally figure. These figures are seen in Table 2**.**

In the 2000 video project selections of the VCR tapes were viewed and fish on them counted. That number was then compared to the number of fish on a corresponding AVI file. The process described above and used in 2001-2002 was much more time consuming per fish viewed but produced better information about the precise reasons for counting errors.

Power Equipment

Aquair UW propeller driven water generator: This generator had very little output for the water speed encountered at the fishwheel (approx. 6-8 ft/sec). It could only produce 1-2 amps. When the project was run in the daytime hours (no lights needed), the camera, laptop and VCR was able to run without a supplemental generator and keep a full charge at the batteries. Its use is recommended only after carefully assessing the water current at each site, power needs of the project, costs ($2000.00) and work of setting up. On a positive note it seems like a durable, continuous use piece of equipment.

Honda 1000 watt generator (EU1000I): With the color video camera running at higher shutter speeds, it required about 180 watts of light at night to produce a nice picture. This plus other equipment (camera, VCR, and inverter) came to under 300 watts which this generator easily handled on a lower RPM setting that this generator was equipped with. This also boosted gas economy to 10 hours per filling. An extended gas supply was run into the generator's carburetor for more use without refueling. When not in use the extended gas supply was lowered to a level below the generator to avoid possible problems associated with a leaking carburetor needle valve. Another method was also used where the fuel supply was run into the generator fuel pump. It required more dismantling of the generator but the fuel supply could then be kept at a level lower than the generator. Although not necessary a timer switch was also wired into the generator so that the generator would shut off whenever you desired. The generator was light and ran on the shore in a converted doghouse with an open front and a 6" square hole in the back for the exhaust to blow out. A 100' extension cord ran from shore along the fishwheel spar pole to the equipment enclosure. When the project was run in daytime it was used infrequently. Depending on site or project, the generator could be used as the main fishwheel power source.

Honda 2500-watt generator (EB2500): This generator was used at camp to run the desktop computer.

Batteries: Four 6-volt deep cycle batteries supplied the stored 12-volt DC power. While fewer batteries could be used a generator shut down could necessitate the use of this much reserve power to keep the video running. Also this kind of reserve allowed the water generator to not have to run on days when river drift was especially bad. The batteries all sat neatly in an inexpensive waterproof plastic tote in the bottom of the equipment enclosure on the wheel.

Battery charger: A 10/30/50 amp (Schumacher SE-1250), taper charge, automobile type, charger was used. As the charger will run constant at 8 amps at night with lights on, any taper charge, 15 amps or larger should be fine.

Inverter for light: An inexpensive 150-watt modified sine wave inverter worked well and drew minimum watts. A 300 watt modified sine wave inverter was used also and had the advantage of a power off switch.

Lights: Two 90-watt halogen 27^{0} beam GE floodlights. One was run off an inverter from the DC batteries in case the gas generator system ever shut down. The other light ran directly off the generator in case the DC inverter system failed. Each light had an adjustable light sensor wired in and was quite workable with each light coming on independent of the other as darkness progressed. During a generator, light or inverter failure, one light could produce a dark yet fully countable video.

Fishwheel Chute

On wheels equipped with live boxes a "chute" is used to pass the fish from the wheel baskets over the raft logs and into the live box. Wheel sites do exist that do not require vertical adjustments to the axle; this site however required adjustment in times of lower water. The chute, therefore, had to be adjustable to match up with the changing level of the baskets or fish injuries could increase from fish dropping rather than sliding into the chute. The chute enclosure in 2000 was the source of some of the greatest trials and tribulations (Zuray, 2000). In 2001 the laptop/switch method developed, with the help of USFWS biologist Dave Daum, eliminated the need for all the sunlight and wind blocking structures of the fishwheel chute. The bottom (viewing area) of the chute was lined with white UHMW 3/16'' thick plastic. It was easily cleaned and stayed white which was the preferred color background for photographic reasons.

Chute Door/ Magnetic Switch

A door made of 1/4-inch plywood covered with 3/8-inch thick closed cell foam was constructed to fit over the exit area of the camera chute. The magnet that activated the trigger switch was mounted on the door. The switch itself was mounted in a stationary position adjacent to the magnet. When the door moved outward approximately three inches the magnetic field around the switch weakened sufficiently to close the switch. This sent an electrical current to a serial interface that in turn communicated the switch event with the computer. The door was hinged on top with fish exiting out the bottom. The operation of the door had to be light enough so that even small whitefish could open it, and at the same time, it had to close positively without bouncing when large fish passed. Bouncing of the door could cause the switch to open again after a fish had passed, resulting in empty frames captured. A 2-foot wooden rod was attached to the top of the door and acted as a counter-balance. The rod was attached by a length of nylon cord that passed through a pulley to a weight suspended in an "ABS" plastic pipe that was filled with a water/anti-freeze mixture for all weather use. The weight was made of a plastic pill bottle filled with the solution and some lead shot. The action of the weight, dampened by its movement through the liquid, caused the door to slow down just before it reached the closed position, providing bounce-free operation. This system, developed on site, worked very well but required considerable trial and error to install correctly. The length of the handle, the height of the pulley, and the amount of shot used for weight are factors that have to be synchronized. This dampening system was necessary because of the vast differences in the way a 1/2-pound cisco and a 50-pound chinook salmon went through a hinged door. A buzzer was installed in-line with the switch to provide an audible indicator that the switch was working.

Fishwheel Construction

It is counterproductive to install a video system only to have fish injured by the fishwheel unnecessarily. The fishwheel used was specially built to try to eliminate injuries. Basket sides have seine webbing and no braces creating a sort of trampoline in the critical areas. The basket bed is lined with high-density plastic webbing instead of wire. All entrance and exit doors are lined with closed-cell foam. Easily removable paddleboards of different sizes allow much control of the fishwheel rotation speed. Rotation speed needs to be consistent with no prolonged hesitations but should not be so fast as to lift the fish high before it has a chance to migrate towards the basket chutes.

Electronics

Panasonic color 1/3" format CCTV camera: (model WV-CP474 with 480 lines horizontal) this camera has many user selectable features including shutter speed that was critical for providing quality images. The camera has 12 volt power input and standard BNC video connectors for video output. Numerous lenses are available. The lens selected is described below. This camera used in 2001 produced noticeably better images than the similar model WV-CP464 used in 2000.

Lens: By Computar vari-focus model TG3Z271FCS, 2.7-8mm, F1.0 TV lens, color camera. A nice piece of equipment, new in 2002 improved the pictures that made the system work. The color, zoom and focus capabilities of this camera were essential features. The camera mounts and waterproof case were under $1000. A waterproof camera housing was necessary and we kept a good amount of silica gel in it at all times to absorb any water vapor trapped inside the case (Pelco Surveillance Camera Housing).

Monitor: 3"X5" color LCD wired to the 12 volt system and the VCR provided a picture of the camera's view for focusing, zooming, positioning and camera parameter settings. All of these of course needed to be done on the wheel. It was supplied with 6-ft long wires and could be put right next to the camera during these adjustments for easy viewing.

Video Recorders: Video cameras were connected to a 12 volt DC video recorder (Panasonic AG-1070dc) with 12 and 24-hour time-lapse capability. The video recorder was placed in a waterproof Pelican case and wires ran to the outside via waterproof connectors. The video recorder stored images on the videotape at a rate of approximately 5 frames per second on the 12 hour setting and it had a date and time stamp feature that was used at all times. A matching, second video recorder was used to play images into the video capture card/computer. These VCRs have factory-cleaning recommendations of every 60 hours. Conditions at the wheel are very clean and dry and new tapes are used for each recording, but use is sometimes pushed well beyond the 60 hours. VCR's are sent in for cleaning, adjustment and parts replacement after every season. This model of VCR is no longer manufactured.

Desktop Computer: A desktop computer was used in camp to download video files from the fishwheel video system, review and tally fish, capture fish from VCR tapes, and organize data in spreadsheets and graphs. The computer had 1000 Mhz Pentium III processor, 384 MB of SDRAM memory, Windows 98 SE operating system, Recordable/Rewriteable 12x/8x/32x CDRW, analog PCI video capture card, and a PC card reader. The PC card reader was used to download the video files from the IBM micro-drive. All files were backed up on compact disk.

Laptop: The laptop was connected directly to a camera on the fishwheel though a USB analog capture card. The laptop was a Panasonic Toughbook CF-48. It was the only laptop found that was capable of running on straight 12-volt DC current. The laptop had a Pentium III 700 Mhz processor, Windows 98 SE operating system, 20 GB hard drive, 256 MB of SDRAM, and an 8 MB video card. An IBM 1 GB micro-drive was used to move video files from the laptop to the camp's desktop computer. The laptop was enclosed in a waterproof case. This laptop system had a complete backup available on site in 2002.

Capture and video review software: Salmonsoft capture software Vcap 1.3.3 was used to capture fish images off the fishwheel. The software allowed use of a trigger switch to record fish images as they slide down the fishwheel chute. In camp, video files (AVI format) were reviewed and tallied using Salmonsoft viewing software Vcap Rev 1.3.4. This software could view video files, play files forward and reverse using user controlled scroll speeds, and tally fish with user defined keyboard keys.

Wireless Video Communications System: Model CS-300 made by Premier Wireless Inc. This 5.8 Mhz microwave transmitter and receiver were used to experiment with sending the video signal from the fishwheel to camp 1/2 mile away. The objective was to run the system for the entire fall season along side the existing video capture system to see how it performed in various environmental conditions, i.e., wind, rain, and fog. The system performed perfectly in 2002 and plans are underway to install a complete system on the fishwheel in 2003 thereby eliminating the need for having the laptop capture system on the fishwheel. All video capture would be done back at camp. This would reduce power requirements at the fishwheel, reducing amp/hr usage from approx.3.4 to around .5 amp/hr. The USFWS loaned the wireless system used in 2002. Hopefully, additional funding can be acquired to purchase a system dedicated to this project.

Results and Discussion

CPUE Data

Data provided by the Rapids video project gives fishery managers additional information to help confirm or reassess fish passage estimates made in the lower river. This second look takes place after a large amount of subsistence harvest has taken place and the Tanana River component of the fall chum salmon has branched off. Significant amounts of fall chum salmon passing by the Rapids (40 miles above the Yukon's confluence with the Tanana River) are Canadian bound and accurate assessment of these numbers are of great importance in meeting U.S. border passage obligations. (Figure 9 – map)

Figure 1 compares 2000-2002 daily 24hr counts at Rapids video. Using the start to finish date of the fall project, cumulative CPUE is as follows: (for comparison, the percentage of this cumulative total of the total estimated passage generated by the Rampart Rapids Tagging Project is also shown)

Date	Video Cum. Total	% of Tag Total
2000	21,280	ended early (poor run)
2001	31,103	16%
2002	35,293	18%

This fall during conversations with Yukon fall chum managers concern was expressed by myself and others over certain Pilot Sonar pulse estimates being so dramatically different when they arrived at some upriver projects (one pulse in particular - Figure 2). If one took the improbable position that chum migrate in a lock step fashion once they entered the river then Rapids video test wheel counts suggest that for a 10 day block of time 41% of the total Pilot Sonar passage was being captured by a single fishwheel at Rapids 19 days later. Known chum migration behavior shows much variation in pulses as they move up river. Large short pulses at the mouth commonly get spread out as they progress up river. Within the same year one pulse will arrive a day or so early yet the next may be similarity late. Some of the anomaly discussed above may be attributed to the fact chum do not travel in a regimented manner. Some may be attributed to fishwheel efficiency changes related to low or high water conditions. It seems reasonable to say however that this does not satisfactorily answer the questions brought up by this season's data. First, the anomaly repeated itself at Chandalar sonar project even more dramatically. Second, the Canadian border test wheel results compared very similar to Rapids video results. Third, large parts of Pilot sonar pulses prior to and after the pulse in question would have had to travel at twice and/or almost half the normal speed to produce the situation by itself (Figure 2). All this begs for a better understanding of the migration behavior of chum salmon.

The majority of chum passing the Rapids video wheel pass the Chandalar Sonar or the Canadian Border test fishwheels. Comparisons between these projects and Rapids are particularly relevant for that reason. Figure 3 and 4 comparisons show very similar pulse timing and intensity changes between Rapids and these two projects.

Figures 5 and 6 are beginning attempts by this project and the USFWS in Fairbanks to investigate possible effects of changing water levels on the Rapids video fishwheel (also known as Rapids south wheel). The problem with charting water levels against changing CPUE is that it is impossible to tell if the relationship is a function of water levels, of legitimate CPUE changes, or both. What is needed is to compare what is actually happening in the river with Rapids video CPUE. Rapids video has the unique good fortune (thanks to the USFWS Rampart Rapids Tagging Project) of having abundance estimates concurrent with its CPUE data. The tagging project is generally considered to be relatively accurate picture of weekly chum passage estimates so these figures were used in figure 6 as something to compare video counts to. If one then takes the position that the tagging estimates are correct then Rapids video data shows fishwheel efficiency increasing many times over during pulses 4 and 5. Water levels during 4 and 5 were high but so were water levels in pulse 6 and Rapids video showed very low efficiency during that pulse. The Pilot sonar to Rapids video discrepancy mentioned above is thought to be a function of high water. That discrepancy happened during pulse four one of the higher water level weeks of the season. Pulse 5 had higher water yet Rapids video efficiency dropped by 25%. Further investigations into graphs 5 + 6 continue to point out that clear and immediate answers have not been found.

Much more work will be done on these subjects and more years looked at in the future. Currently Tevis Underwood (USFWS Fairbanks and Rampart Rapids tagging project leader) and Dave Daum (USFWS Fairbanks, video systems research) are helping this project to develop methods for looking at these subjects. The above results and discussion opinions are my own however.

Operation and equipment

The project and video system operated for 49 days. Of those, 46 were for complete 24-hour periods. The shortest day was 12 hrs on the last day of sampling (Sept 19). Data were recorded for 24hr/day on all scheduled days off (Sunday) in 2002.

The new system again proved to be very accurate at counting fish that were captured by a fishwheel. Many of the potential fish handling problems associated with fishwheel capture have been eliminated by the development of this method. The video capture system used in 2001-2002 had many improvements over the system used in 2000. Being able to have the laptop computer and capture software eliminate empty frames and store frames containing fish in real time on the fishwheel was a time saving of two hours for each 12 hours of data collected. Originally there was concern about operating a laptop on the fishwheel because of the wet environment. The amount of computer work needed on the wheel was very small and the enclosure kept the system dry. As was noted in 2001 when observing the condition of the equipment used at the fishwheel, the laptop computer in 2002 stayed much cleaner and less prone to environmental damage than the desktop computer and VCRs back at camp that worked in much dustier conditions.

Finding the best software program settings that controlled the amount of frames captured before and after the magnetic switch was tripped was a matter of trial and error during the test period prior to the official start date. A setting that captured more frames than was necessary would mean larger than needed file sizes and more time spent reviewing video files. Settings that captured not enough frames caused some fish to be missed either because they were not recorded at all or there were so few frames in the video file that human error came into play during the review process. Some adjustments to these settings were made in season usually associated with fishwheel captures of multiple fish when the run was the strongest. The 2002 fall chum video project was primarily used to provide CPUE data with fish needing to be identified by species. If the project were attempting to sex chum salmon the number of frames collected might need to be increased. In applying this technology to a recapture wheel in a spaghetti tagging study one might also want to increase the numbers of frames collected so tagged and untagged fish could be identified consistently. Because of the improved review program being able to speed up or slow down the review process, more frames captured for each fish does not substantially slow down the overall counting process. The increase in file size this may cause is also of small consequence considering the storage capacity of the laptop hard drive, micro drive transfer disk and final storage on CD-R disks.

A good review program is important for accurate and timely counting of captured fish. Improvements made to the program in 2001 allowed the user to adjust the speed at which the frames were reviewed. The tally for each species was made with a single click of the computer mouse instead of a mechanical counter and hand tallied on a paper form. Reverse, stop and forward controls we easily accessible and controlled by the keyboard. These features became more important as the numbers of fish counted in a day increased. In 2002 the project counted 2003 chums on Sept. 6. At high numbers such as these every refinement becomes meaningful, not just to speed up the process but also to reduce operator error.

Operation of the laptop computer, interface, electronic components, software program, VCR, and camera all worked problem free in 2002. The laptop computer experienced occasional lockups during file transfer if files were large and the capture program was running in the background. The computer interface experienced none of the troubles noted in the 2001 report.

The building and maintenance of the fishwheel chute door was greatly simplified in 2001and 2002. Construction techniques still require attention, as its operation is critical to the proper triggering of the laptop capture system. A door that was too heavy would not allow tiny cisco whitefish through properly and a door that was to light could be triggered by gusting winds. Both these conditions were again dealt with in the 2002 season as a new chute was constructed and a workable compromise was arrived at.

The chute door dampening system never had a problem but did need to be readjusted anytime the chute door was reworked.

The magnetic switch experienced no failures in 2002 (one failure in 2001).

Consultations and Capacity Development

The fall chum 2002 video project continues a close working relationship with the USFWS Office in Fairbanks. Dave Daum, with the USFWS Office in Fairbanks has made four trips this season to help with operations of the video CPUE project and assisted in project assessment. Rapids video projects from 1999 to 2002 have also served as a center for research into fish friendly video development and low impact fishwheel improvements by the project manager and the Fairbanks Fisheries Resource Office. This work continued in 2002. As in all previous years, the projects doors were always open to the public and any agency personnel. A number of persons from the USFWS, ADF&G and the Office of Subsistence Management viewed the workings of the project this summer.

Bill Busher and Fred Bue were the main contact persons at the ADF&G for daily reporting of data from the project.

The Tanana Tribal Council and the Tanana City School District continued in 2002 to run their Fishery Resource Monitoring Project (USFWS, Office of Subsistence Management) called Tanana Fisheries Conservation Outreach. This project has brought multiple groups of elders and school children to the Rapids project site to view and work with the 2002 video project and speak with USFWS fisheries biologists with the Rampart/Rapids fall chum tagging project. Students are put up at the video campsite for four-day periods and are taught how to run their own experimental projects and enter data in worksheets. In 2003 it is hoped that actual student run projects with oversight from biologists can take place.

In 2002 Bill Carter working with the USFWS Office in Fairbanks was assisted in obtaining broad whitefish samples for his telemetry project through the use of the fall chum video project data and fishwheel capture. Some local telemetry tracking was done using the video project operator and boat.

All the major equipment used for the functioning of the 2002 fall chum video project is being provided by the 2001-2003 chinook salmon video project presently funded by the USFWS Office of Subsistence Management.

Conclusions

CPUE data can be dependably and accurately generated by a fishwheel livebox alternative such as a video capture system.

Data on run timing and changing intensity levels of pulses of fall chum generated by Rapids video project are very similar to that obtained by the Canadian border test wheels and Chandalar sonar project. This is significant as the majority of chum passing Rapids are counted by these projects.

Data on run timing and changing intensity levels of pulses of fall chum generated by Rapids video project showed discrepancies with the main lower river assessment sonar at Pilot Station. This situation is being looked into by Federal and State agencies and could lead to new ways to interpret data and a better understanding of the migratory behavior of fall chum salmon.

Recommendations

Work on the recommendations made in 2001 for future improvements to the video system continue and new recommendations include:

1. CPUE data is only valuable in as much as it is a reflection of what's actually happening in the river. To this end the Rapids video project has begun a list of project components that may influence CPUE data (see Project Specifications on page 9). Annual specifications for these components should be included in future project reports to aid in data collection and interpretation.

2. In 2003 USGS water level data for the Yukon River will be looked at with the idea of incorporating it into the assessment of the CPUE data at the Rapids. The effects of high and low water on CPUE should be investigated.

3. An aspect of the video system is still being worked on by USFWS and Salmonsoft. The video review/tally program is being linked into Excel spreadsheets. When the operator finishes with a video file tally the software will automatically write fish species numbers and sample times into the spreadsheet. Daily CPUE will be automatically calculated and daily updates to graphs will be entered. Since temporal data is embedded into each video frame, calculations of sample times can be accomplished automatically. This improved tally/spreadsheet interface should be available for the 2003 season.

4. Proper assessments of test fishwheel projects as well as other fish projects will only be made if raw data and methods of project operations are available in the form of reports. Without reporting requirements projects cannot be assessed for operational integrity and usefulness.

5. An internet web site needs to be run and kept updated with the daily numbers and information from all projects on the Yukon River. Project managers, fishermen, and concerned persons need to have the data in a timely manner to assess their own projects, know when fish pulses are arriving, provide information for Yukon River Drainage Fishermen’s Association (YRDFA) representatives for weekly teleconferences, and to facilitate making more informed decisions. To this end, discussion has been initiated within YRDFA with considerations being given to running a web site that provides timely in-season information.

6. Test fishing projects have the potential to adversely impact the populations they

sample. Improvements will only be made if good reasons are found for doing so. Data are often available for further review from studies already done that could provide much insight into this question. It is important for management to deal directly and openly about this question especially in view of the long held traditional beliefs concerning the impact of handling fish and game species. In 2002 the USFWS Rampart Rapids Fall Chum Tagging Project continued it’s second year of study on the question of possible impacts to chum salmon from the use of fishwheel liveboxes.

Literature Cited

Hatch, D. R., J. K. Fryer, M. Schwartzberg, D. R. Pederson, and A. Ward. 1998. A computerized editing system for video monitoring of fish passage. North American Journal of Fisheries Management. 18:694-699.

Underwood, T. J., S. P. Klosiewski, J. A. Gordon, J. L. Melegari, and R. J. Brown. 1999. Estimated abundance of adult fall Chum salmon in the upper Yukon River, Alaska, 1997. U. S. Fish and Wildlife Service, Fairbanks Fishery Resource Office, Alaska Fisheries Technical Report Number 51, Fairbanks, Alaska.

Brown, 2000**,** Migratory Patterns of Yukon River Inconnu As Determined With Otolith Microchemistry And Radio Telemetry.

Zuray, S., and T. J. Underwood. 1999. Development of Video Technology to Measure Catch-Per- Unit Effort On a Fish wheel on the Yukon River, Alaska. A Report to the Yukon River Panel, Anchorage, Alaska.

Zuray, S., 2000a. Stored Video Images as an Alternative to Fishwheel Live Boxes for the Collection of Chinook Catch Per Unit Effort Data using a Fishwheel on the Yukon River, Alaska. A final report to the Yukon River Panel, Anchorage, Alaska.

Zuray, S., 2000b. Stored Video Images as an Alternative to Fishwheel Live Boxes for the Collection of Fall Chum Catch Per Unit Effort Data using a Fishwheel on the Yukon River, Alaska. . A final report to the Yukon River Panel, Anchorage, Alaska.

Zuray, S., 2001a. Rampart-Rapids Summer Catch-Per-Unit-Effort Video Monitoring – 2001 using a Fishwheel on the Yukon River, Alaska. Federal Subsistence Fishery Monitoring Program Annual Project Report FIS 01- 197, U.S. Fish and Wildlife Service, Office of Subsistence Management, Fishery Information Services Division, Anchorage, Alaska.

Zuray, S., 2001b. Rampart-Rapids Fall Catch-Per-Unit-Effort Video Monitoring – 2001 using a Fishwheel on the Yukon River, Alaska. A final report to the Yukon River Panel, Anchorage, Alaska.

Figure 1

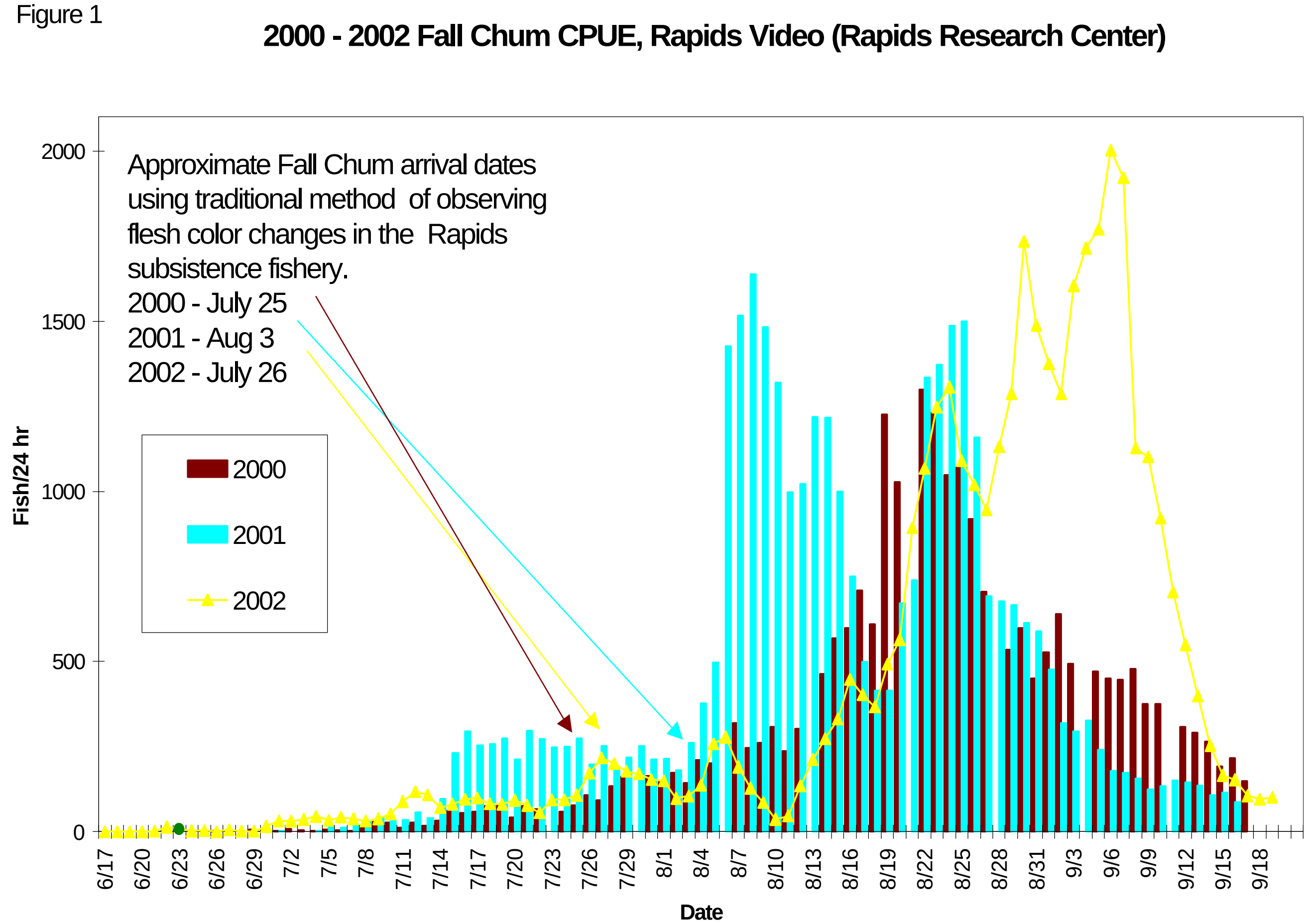


Figure 2

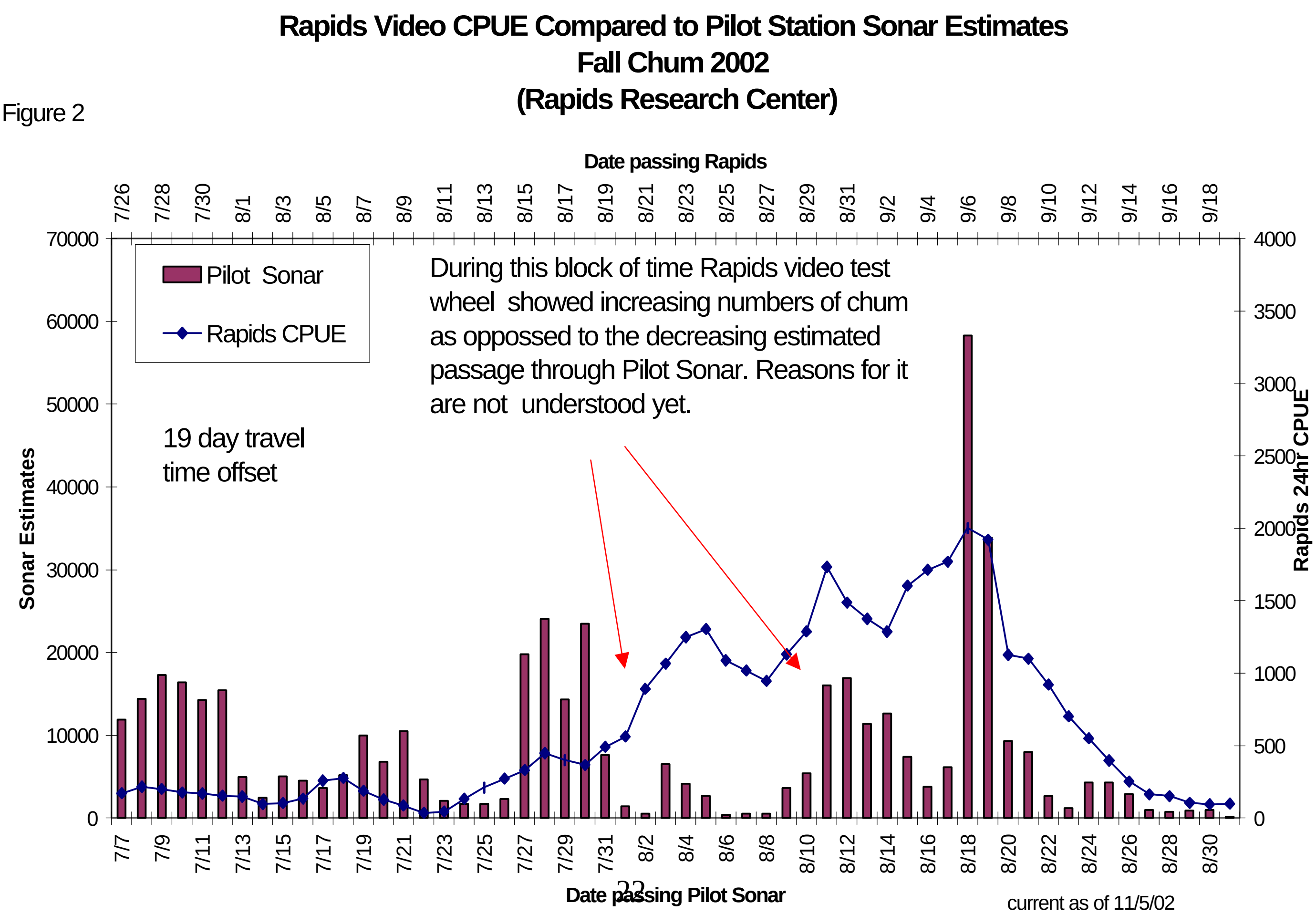
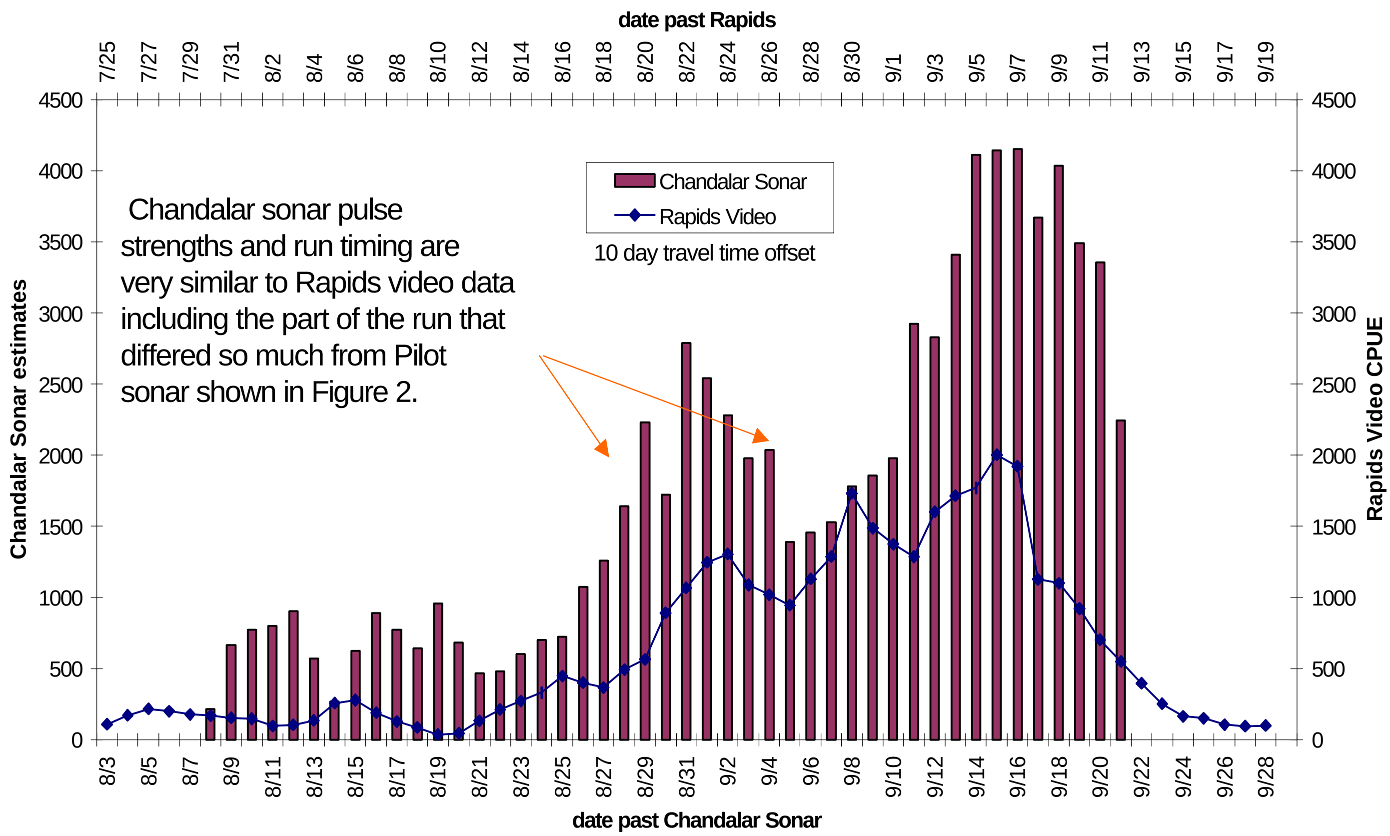


Figure 3

Rapids Video CPUE Compared to Chandalar Sonar Estimates 2002 FallChum (Rapids Research Center)



Rapids Video CPUE and Combined Canadian Border Fishwheel 24 hr. Counts Compared, Fall Chum 2002 (Rapids Research Center)

Figure 4

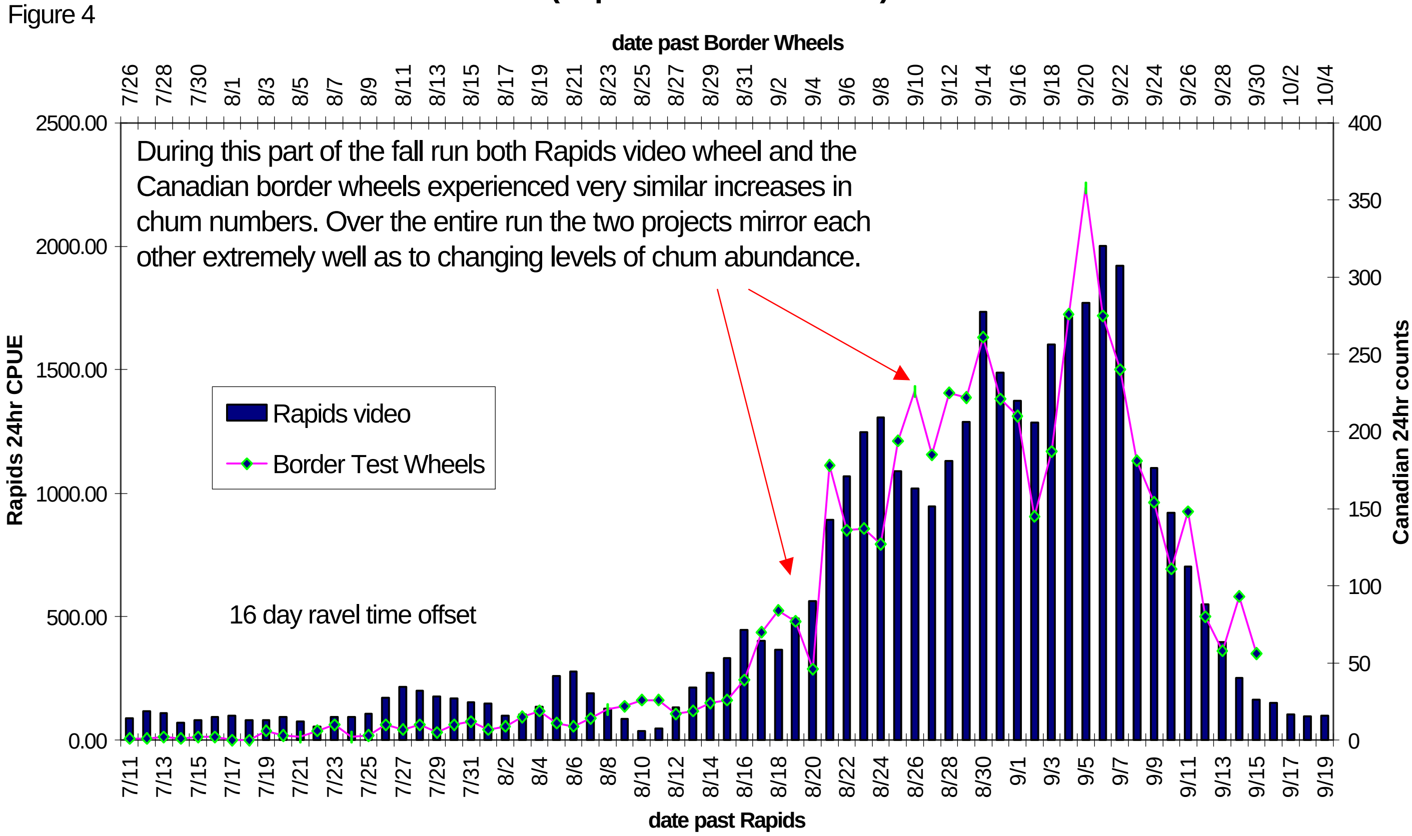


Figure 5

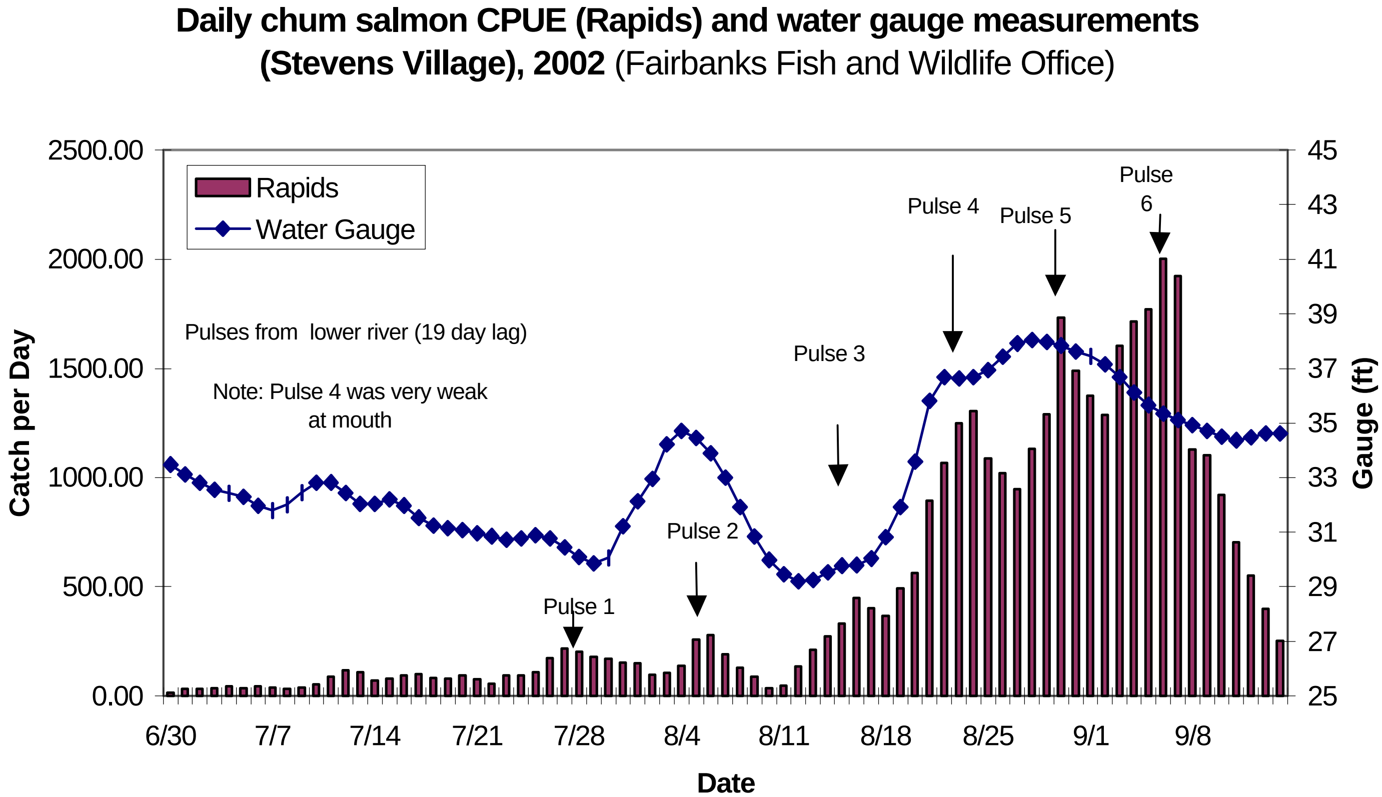


Figure 6

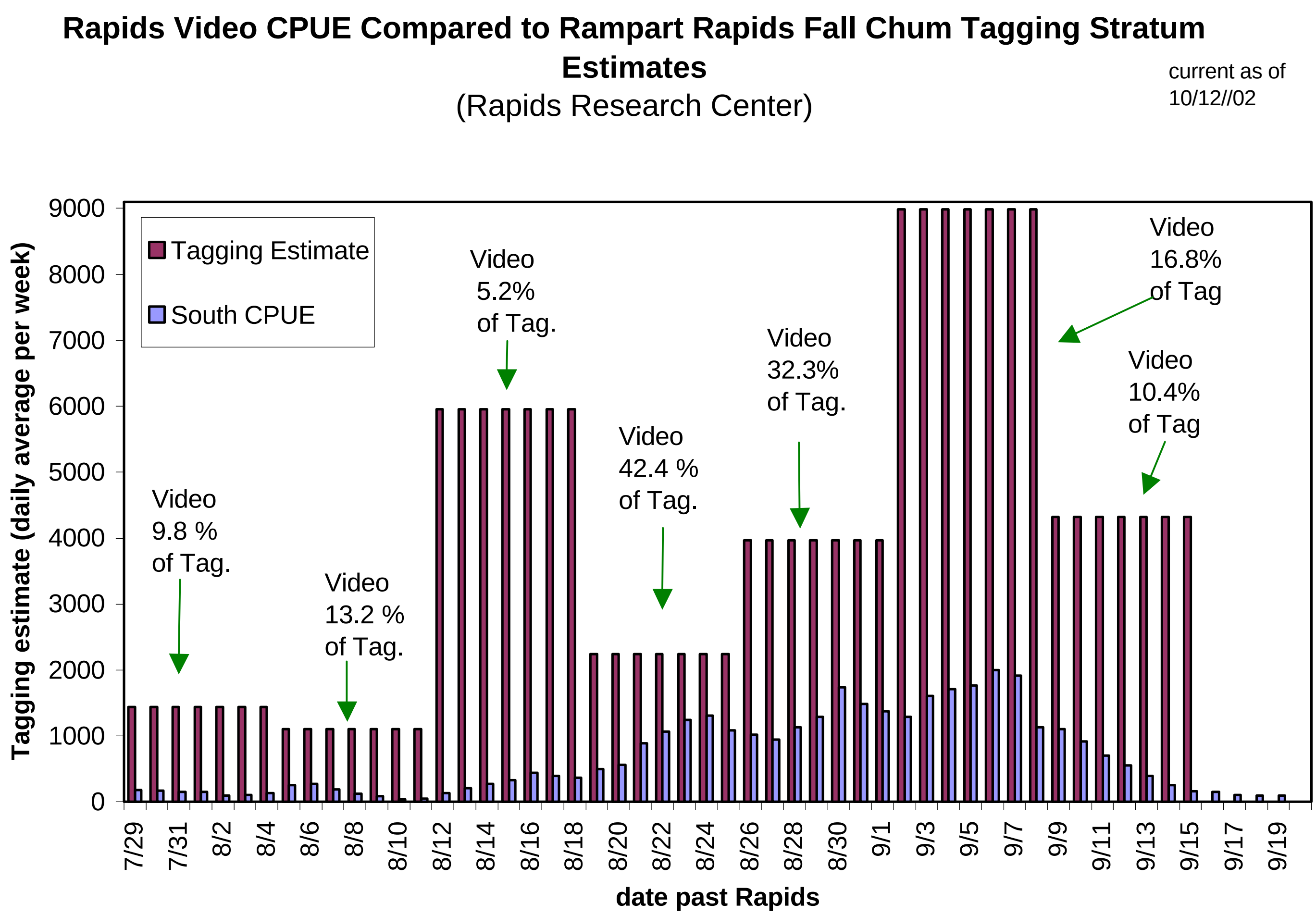


Figure 7

Worksheets at Rapids video shack

Students learn about Rapids tagging (USFWS)

Burbot subsistence

Watching video wheel do its thing

Tanana Conservation Outreach Students

Rapids video test fishwheel (south)

Figure 8

TEK fall chum (red flesh)

Student housing next to video camp

Microwave transmitter on video wheel

Video shack-note microwave reciever dish

Broad whitefish telemitry study at Rapids

Video poster night at AFS meeting

Table 1. 2002 Video Short Summary-Rapids-Fall Chum

Start Day	No.	Counting Date	Start Date/Time	End Date/Time	Run Time (hr)	King	Chum	Shee-fish	Broad WF	Hump back	Cisco WF	Comments	King per hr	King / 24 hr	Chum per hr	Chum / 24 hr
Thu	38	7/25/02	7/25/02 8:48	7/25/02 21:57	13.15	11	59	1	1	7	36	45% red flesh chums - kings all poor meat	0.84	20.08	4.49	107.68
Fri	39	7/26/02	7/26/02 9:32	7/26/02 22:32	13.00	8	93	0	3	10	12	**TEK bright fall chums officially here**	0.62	14.77	7.15	171.69
Sat	40	7/27/02	7/27/02 9:09	7/27/02 23:00	13.85	8	125	1	2	10	40	All wheels (4) up + bright fish	0.58	13.87	9.03	216.68
Sun		7/28/02	1/0/00 0:00	1/0/00 0:00	0.00	0	0	0	0	0	0					
Mon	41	7/29/02	7/29/02 9:31	7/29/02 21:42	12.18	0	102	0	4	8	52	Fall chum tagging started	0.00	0.00	8.37	200.93
Tue	42	7/30/02	7/30/02 8:13	7/30/02 21:12	12.98	0	96	0	0	13	52	set up video lights (24 hr)	0.00	0.00	7.39	177.46
Wed	43	7/31/02	7/31/02 0:00	8/1/02 0:00	24.00	3	154	1	0	17	115	fall chums getting darker- main pulse?	0.13	3.00	6.42	154.00
Thu	44	8/1/02	8/1/02 0:00	8/2/02 0:00	24.00	1	149	0	4	19	139	nice chums but main brights have passed	0.04	1.00	6.21	149.00
Fri	45	8/2/02	8/2/02 0:00	8/3/02 0:00	24.00	6	98	3	3	33	172	solidly into fall run now	0.25	6.00	4.08	98.00
Sat	46	8/3/02	8/3/02 0:00	8/4/02 0:00	24.00	9	105	3	8	47	182	Cambell chums increasing	0.38	9.00	4.38	105.00
Sun	47	8/4/02	8/4/02 0:00	8/5/02 0:00	24.00	0	136	0	3	24	192	still most nice chum meat, very few summers	0.00	0.00	5.67	136.00
Mon	48	8/5/02	8/5/02 4:40	8/6/02 0:00	19.33	0	209	2	3	18	210	To Rampart, Paul's wheel increasing	0.00	0.00	10.81	259.45
Tue	49	8/6/02	8/6/02 0:00	8/7/02 0:00	24.00	7	278	4	6	22	130	Cambell 3x test wheel	0.29	7.00	11.58	278.00
Wed	50	8/7/02	8/7/02 0:00	8/8/02 0:00	24.00	0	190	7	5	34	219	smoke in air, lots	0.00	0.00	7.92	190.00
Thu	51	8/8/02	8/8/02 0:00	8/9/02 0:00	24.00	0	128	15	3	30	118	end of bump chums(poor, females)	0.00	0.00	5.33	128.00
Fri	52	8/9/02	8/9/02 0:00	8/10/02 0:00	24.00	1	86	9	6	33	63	Cambell, Johnson down similar,	0.04	1.00	3.58	86.00
Sat	53	8/10/02	8/10/02 0:00	8/11/02 0:00	24.00	1	36	5	8	39	40	Cambell 9hrs/14 chum	0.04	1.00	1.50	36.00
Sun	54	8/11/02	8/11/02 0:00	8/12/02 0:00	24.00	0	46	3	4	38	32	nicer chums -next pulse?	0.00	0.00	1.92	46.00
Mon	55	8/12/02	8/12/02 0:00	8/13/02 0:00	24.00	1	134	5	1	37	15	fresh fish look	0.04	1.00	5.58	134.00
Tue	56	8/13/02	8/13/02 0:00	8/14/02 0:00	24.00	0	212	1	5	23	21	all wheels running -6 in Rapids	0.00	0.00	8.83	212.00
Wed	57	8/14/02	8/14/02 0:00	8/15/02 0:00	24.00	1	273	8	9	21	12	big, nice but darker and lighter flesh pulse	0.04	1.00	11.38	273.00
Thu	58	8/15/02	8/15/02 0:00	8/16/02 0:00	24.00	0	331	10	10	10	29	subsistence closed ADF+G	0.00	0.00	13.79	331.00
Fri	59	8/16/02	8/16/02 0:00	8/17/02 0:00	24.00	0	448	4	4	7	29		0.00	0.00	18.67	448.00
Sat	60	8/17/02	8/17/02 0:00	8/18/02 0:00	24.00	0	402	7	3	2	44	bear on fish racks	0.00	0.00	16.75	402.00
Sun	61	8/18/02	8/18/02 0:00	8/19/02 0:00	24.00	0	367	12	3	4	58	caught 5% of total Pilot fall run 18 days ago	0.00	0.00	15.29	367.00
Mon	62	8/19/02	8/19/02 0:00	8/20/02 0:00	24.00	1	492	13	9	5	57	caught 34% of total run (18 day lag)	0.04	1.00	20.50	492.00
Tue	63	8/20/02	8/20/02 0:00	8/21/02 0:00	24.00	0	564	33	3	8	49	caught 103%, 350,000+ TEK chums through	0.00	0.00	23.50	564.00
Wed	64	8/21/02	8/21/02 0:00	8/22/02 0:00	24.00	0	893	48	5	3	76	caught 14%, fish darker than 8/16 pulse	0.00	0.00	37.21	893.00
Thu	65	8/22/02	8/22/02 0:00	8/23/02 0:00	24.00	2	1067	52	5	5	127	caught 25%, mystery why large chum CPUE?	0.08	2.00	44.46	1067.00
Fri	66	8/23/02	8/23/02 0:00	8/24/02 0:00	24.00	0	1248	42	4	3	137	caught 46% of estimate at Pilot 18 days ago	0.00	0.00	52.00	1248.00
Sat	67	8/24/02	8/24/02 0:00	8/25/02 0:00	24.00	0	1306	31	14	4	127	caught 333% ,	0.00	0.00	54.42	1306.00
Sun	68	8/25/02	8/25/02 0:00	8/26/02 0:00	24.00	0	1089	36	7	2	69	caught 216%,	0.00	0.00	45.38	1089.00
Mon	69	8/26/02	8/26/02 0:00	8/27/02 0:00	24.00	1	1019	37	15	5	42	caught 199% of Pilot Sonar' chum	0.04	1.00	42.46	1019.00
Tue	70	8/27/02	8/27/02 0:00	8/28/02 0:00	24.00	1	946	53	12	3	27	caught 26%	0.04	1.00	39.42	946.00
Wed	71	8/28/02	8/28/02 0:00	8/29/02 0:00	24.00	0	1131	57	16	3	28	caught 21%	0.00	0.00	47.13	1131.00
Thu	72	8/29/02	8/29/02 0:00	8/30/02 0:00	24.00	0	1288	62	25	5	39	8% , north wheel whitefish project	0.00	0.00	53.67	1288.00
Fri	73	8/30/02	8/30/02 0:00	8/31/02 0:00	24.00	0	1734	41	13	12	36	10%	0.00	0.00	72.25	1734.00
Sat	74	8/31/02	8/31/02 0:00	9/1/02 0:00	24.00	0	1488	63	9	3	24	13%	0.00	0.00	62.00	1488.00
Sun	75	9/1/02	9/1/02 0:00	9/2/02 0:00	24.00	0	1375	54	10	9	11	11%	0.00	0.00	57.29	1375.00
Mon	76	9/2/02	9/2/02 0:00	9/3/02 0:00	24.00	0	1287	67	6	5	25	17%, Water down 6" from high (fh)	0.00	0.00	53.63	1287.00
Tue	77	9/3/02	9/3/02 0:00	9/4/02 0:00	24.00	1	1604	56	7	2	24	42%, water down 18" fh	0.04	1.00	66.83	1604.00
Wed	78	9/4/02	9/4/02 0:00	9/4/02 23:43	23.72	0	1695	66	7	12	8	28%, hole repaired-17 min. down	0.00	0.00	71.47	1715.25
Thu	79	9/5/02	9/5/02 0:00	9/6/02 0:00	24.00	0	1770	68	11	7	13	3%, water dropping fast	0.00	0.00	73.75	1770.00
Fri	80	9/6/02	9/6/02 0:00	9/7/02 0:00	24.00	0	2003	72	7	11	13	6%, water down 3'6'' fh	0.00	0.00	83.46	2003.00
Sat	81	9/7/02	9/7/02 0:00	9/8/02 0:00	24.00	0	1922	97	15	9	10	21%	0.00	0.00	80.08	1922.00
Sun	82	9/8/02	9/8/02 0:00	9/9/02 0:00	24.00	0	1127	63	5	10	6	14%	0.00	0.00	46.96	1127.00
Mon	83	9/9/02	9/9/02 0:00	9/10/02 0:00	24.00	0	1101	81	7	13	5	40%	0.00	0.00	45.88	1101.00
Tue	84	9/10/02	9/10/02 0:00	9/11/02 0:00	24.00	1	922	75	11	6	15	79%	0.04	1.00	38.42	922.00
Wed	85	9/11/02	9/11/02 0:00	9/12/02 0:00	24.00	0	704	63	7	14	9	16%, most in close to spawn condition now	0.00	0.00	29.33	704.00
Thu	86	9/12/02	9/12/02 0:00	9/13/02 0:00	24.00	0	550	84	10	9	9	13%	0.00	0.00	22.92	550.00
Fri	87	9/13/02	9/13/02 0:00	9/14/02 0:00	24.00	0	398	83	16	10	10	14%	0.00	0.00	16.58	398.00
Sat	88	9/14/02	9/14/02 0:00	9/15/02 0:00	24.00	0	253	64	33	9	11	26%, last day of tagging	0.00	0.00	10.54	253.00
Sun	89	9/15/02	9/15/02 0:00	9/16/02 0:00	24.00	0	165	58	27	1	3	22%	0.00	0.00	6.88	165.00
Mon	90	9/16/02	9/16/02 0:00	9/17/02 0:00	24.00	0	152	47	26	6	6	17%	0.00	0.00	6.33	152.00
Tue	91	9/17/02	9/17/02 0:00	9/18/02 0:00	24.00	0	106	44	40	6	7	11%, Tag crew left, subsist. open 12 hr	0.00	0.00	4.42	106.00
Wed	92	9/18/02	9/18/02 0:00	9/19/02 0:00	24.00	0	96	41	23	7	8	43%	0.00	0.00	4.00	96.00
Thu	93	9/19/02	9/19/02 0:00	9/19/02 12:00	12.00	0	50	18	9	10	3	last day-pulled wheel.	0.00	0.00	4.17	100.00

Table 2. Final assessment figures

Table 2. Fall Chum 2002 Final Assessment

Fish found on original VCR tapes but missed by video capture system are noted below as missed.

Fish found on original VCR tapes and counted by video capture system are noted below as capture.

Six hours or the first 50 fish of each week are used for the assessment sample (minimum).

Tape No.	Date	Sample Time	Fish Assessed	Chum Captured	King Captured	Sheefish Captured	Broad Whitefish Captured	Humpback Whitefish Captured	Cisco Whitefish Captured	Other Captured	Missed (reason)
44	8/1	3hrs 27min	56	23	0	0	1	6	25	0	1 cisco (under door)
50	8/7	2hrs 25min	50	15	0	0	0	3	31	0	1 cisco (under door)
58	8/15	3hrs 3min	51	47	0	1	0	1	1	0	1 cisco (under door)
66	8/23	1hr 2min	52	44	0	3	0	0	5	0	0
74	8/31	53min	54	51	0	2	0	0	0	0	0
84	9/10	1hr 26min	57	51	0	6	0	0	0	0	0

Figure 9 – Project Site

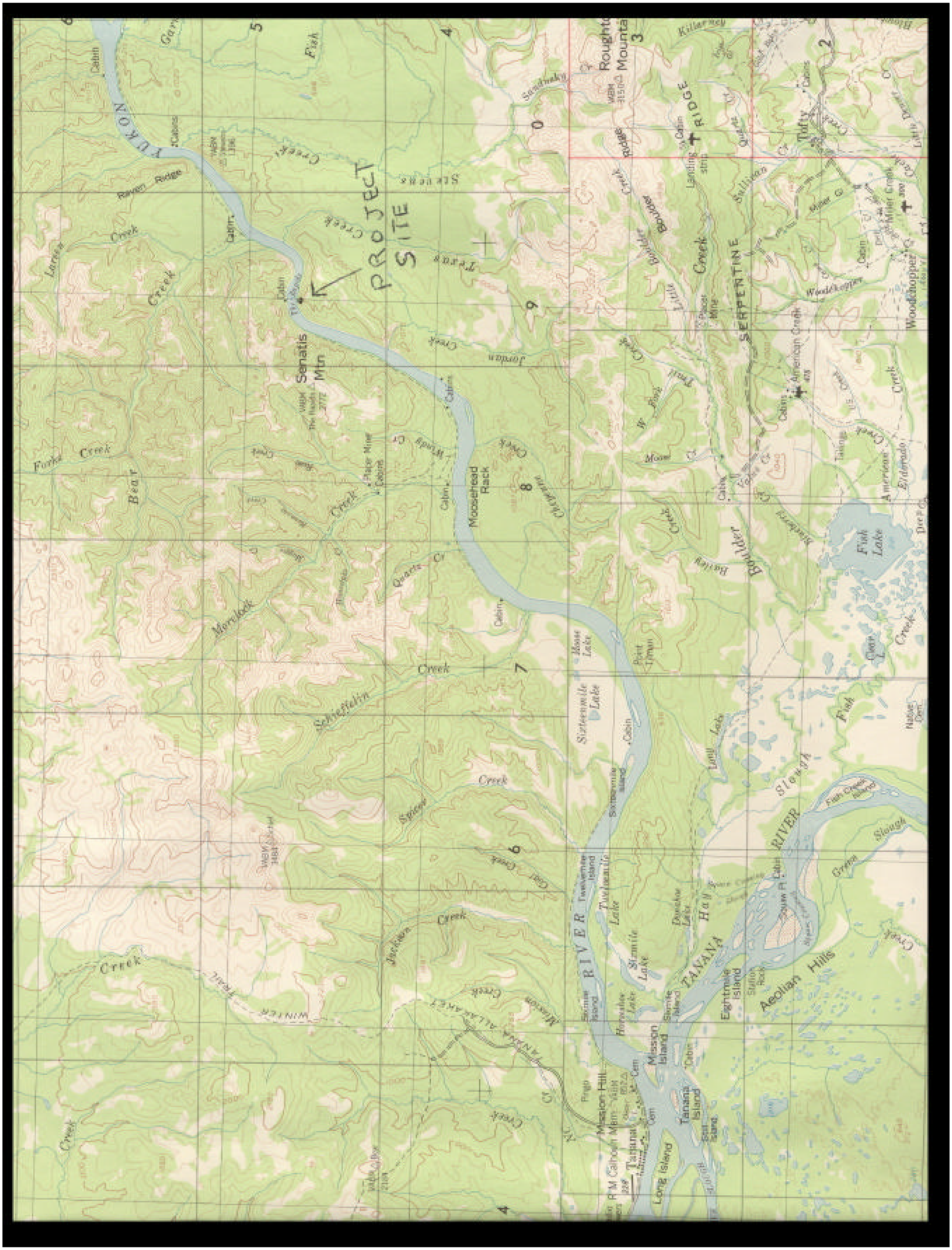
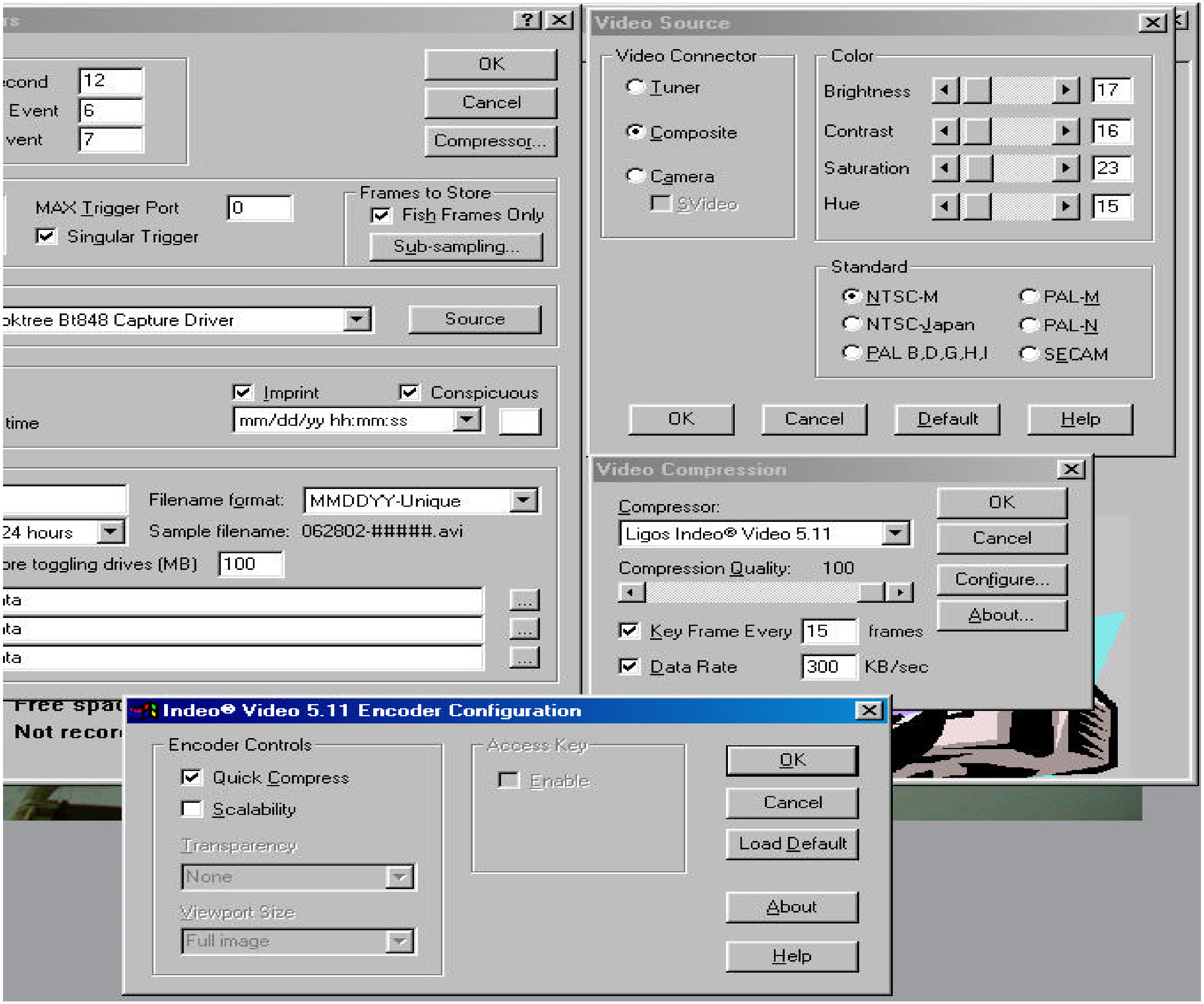


Figure 10


OK
Cancel
Compressor...
MAX Trigger Port
0
Singular Trigger
Frames to Store
Fish Frames Only
Sub-sampling...
Source
Imprint
Conspicuous
mm/dd/yy hh:mm:ss
Filename format:
MMDDYY-Unique
Sample filename:
062802-#####.avi
24 hours
Video Source
Video Connector
Tuner
Composite
Camera
SVideo
Color
Brightness
17
Contrast
16
Saturation
23
Hue
15
Standard
NTSC-M
PAL-M
NTSC-Japan
PAL-N
PAL B,D,G,H,I
SECAM
OK
Cancel
Default
Help
Video Compression
Compressor:
Ligos Indeo® Video 5.11
Compression Quality:
100
Key Frame Every
15
frames
Data Rate
300
KB/sec
OK
Cancel
Configure...
About...
Indeo® Video 5.11 Encoder Configuration
Encoder Controls
Quick Compress
Scalability
Transparency
None
Viewport Size
Full image
Access Key
Enable
OK
Cancel
Load Default
About
Help

Disclaimer

The mention of trade names of all commercial products in this report does not constitute endorsement or recommendation for use by the federal government.

Non-Discrimination Statement

This report, and the study it was based on, was done with federal funding obtained through the U.S. Fish and Wildlife Service, Office of Subsistence Management. This agency conducts all programs and activities free from discrimination on the basis of sex, color, race, religion, national origin, age, marital status, pregnancy, parenthood or disability. Any person who believes they have been discriminated against should write to O.E.O., U.S. Department of the Interior, Washington, D.C. 20240.

U.S. Department of the Interior
Office for Equal Opportunity
1849 C. Street, NW
Washington, D.C. 20240