Regional Operational Plan CF.2A.2017.01

Lower Cook Inlet Remote Video Salmon Escapement Monitoring Operational Plan, 2017–2019

by

Edward O. Otis

April 2017

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	e
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	E
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	$\log_2$, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

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by

Edward O. Otis

Alaska Department of Fish and Game, Division of Commercial Fisheries, Homer

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Division of Commercial Fisheries

April 2017

The Regional Operational Plan Series was established in 2012 to archive and provide public access to operational plans for fisheries projects of the Divisions of Commercial Fisheries and Sport Fish, as per joint-divisional Operational Planning Policy. Documents in this series are planning documents that may contain raw data, preliminary data analyses and results, and describe operational aspects of fisheries projects that may not actually be implemented. All documents in this series are subject to a technical review process and receive varying degrees of regional, divisional, and biometric approval, but do not generally receive editorial review. Results from the implementation of the operational plan described in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author if you have any questions regarding the information provided in this plan. Regional Operational Plans are available on the Internet at: http://www.adfg.alaska.gov/sf/publications/

Edward O. Otis,
Alaska Department of Fish and Game, Division of Commercial Fisheries,
3298 Douglas Place, Homer, AK 99603

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Signature Page

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Approval

Title	Name	Signature	Date
Project leader	Edward O. Otis		3-29-17
Research Coordinator	Jack Erickson		3-29-2017

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PURPOSE

This plan documents standard procedures for estimating sockeye salmon *Oncorhynchus nerka* escapement into Mikfik and Chenik lakes in Kamishak District using remote video cameras and digital time-lapse recording equipment. Hard drives are retrieved regularly and video reviewed immediately to assess run-timing and magnitude to facilitate informed inseason management of commercial purse-seine fisheries targeting these stocks (Hollowell et al. 2016). Managers use these data to adjust fishery openings in season to attain established escapement goals. The annual escapement indices derived by remote video are also periodically used to refine the sustainable escapement goals for these stocks, currently established by ADF&G at 3,400–11,000 for Mikfik Lake and 2,900–13,700 for Chenik Lake (Table 1; Otis et al. 2010, Otis et al. 2013, Otis et al. 2016).

Key words: Lower Cook Inlet, Kamishak Bay, Mikfik Lake, Chenik Lake, salmon, sockeye salmon, video, escapement, monitoring, counting tower, AVCT

BACKGROUND

The Lower Cook Inlet management area (LCIMA) comprises waters of the Cook Inlet Area, south of the latitude of Anchor Point including the western shore of Cook Inlet south to Cape Douglas, and the eastern shore of Cook Inlet along the Kenai Peninsula to Cape Fairfield. This area is included in Area H and encompasses all coastal waters and inland drainages entering this area.

This salmon management area is divided into 5 districts that correspond to local geography and distribution of the 5 species of Pacific salmon. Commercial salmon fisheries occur in all but the Barren Islands District (Figure 1). The management objective for all districts is the achievement of spawning escapement goals for major stocks, while allowing for orderly harvest of fish surplus to spawning requirements.

The use of aerial surveys to monitor salmon escapement on small clear streams in Alaska began in the 1930's (Eicher 1953) and continues today (Jones et al. 2007). This technique is favored for remote and marginally productive stocks which otherwise may go unassessed due to the high cost of intensive monitoring methods (e.g., weir, sonar) relative to the stream's modest escapement. However, aerial survey has several drawbacks. Observer experience, water clarity, stream morphology and habitat type, timing and periodicity of survey flights, and stream residency are just a few factors shown to influence the accuracy and precision of aerial survey estimates of salmon escapement (see Bevan 1961, Neilson and Geen 1981, Cousens et al. 1982, Shardlow et al. 1987, Perrin and Irvine 1990, Hill 1997, Bue et al. 1998, and Jones et al 2007). Researchers have developed sophisticated statistical approaches for dealing with some of these problems (e.g., Hilborn et al. 1999, Adkison and Su 2001, Su et al. 2001), but aerial survey remains an imprecise escapement monitoring tool. At best, it provides consistent indices of in-river escapement among years. It does not provide accurate, reliable estimates of spawner-abundance, particularly when in-river exploitation or predation of salmon is high (Peirce et al. 2011, Peirce et al. 2013) and observer efficiency and stream residency are not precisely known (Perrin and Irvine 1990, Bue et al. 1998, Jones et al 1998).

Accurate, reliable estimates of spawner abundance are required to assess stock-recruit relationships (Walters and Ludwig 1981), monitor long-term trends in the status of salmon resources (Baker et al 1996), set appropriate spawning escapement goals for individual streams

(Otis et al. 2016), and manage commercial fisheries in season (Hollowell et al. 2016). Because aerial survey cannot always provide this level of information and more accurate methods are prohibitively expensive for streams with marginal escapements, a niche exists that remote video technology can help to fill. Fishery biologists have long considered the potential for photographic enumeration to eliminate the biases inherent to human derived aerial, ground, and tower counts of salmon escapement. In the late 1940's and early 1950's, researcher's experimented with aerial and tower based photography to count sockeye salmon in the Bristol Bay area (see Kelez 1947, Eicher 1953, and Mathisen 1962). While these early experiments showed promise, their feasibility was reduced by the state of technology of cameras and recording equipment from that era.

Considerable technological advancement has occurred since that time and recent video and time-lapse recording systems have proven effective in a wide variety of applications. Video has been used successfully to evaluate the use of underwater habitat features (Groves and Chandler 1999, Carlson and Quinn 2005), evaluate the accuracy of side-looking sonar to count out-migrating salmon fry (Mueller et al. 2006), estimate residency on spawning redds (Shardlow 2004), monitor fish wheel catch (Daum 2005), count and measure juvenile salmon in a controlled field situation (Irvine et al. 1991), evaluate spatial and temporal patterns of smolt outmigration (Davidsen et al 2005), track fish swimming movements (Hughes and Kelly 1996), and count fish at passageways (Haro and Kynard 1995, Davies et al. 2007). The use of time-lapse video at dam fish passageways along the Columbia River system (Hatch et al. 1994, Hiebert et al. 2000) has advanced to the point where researchers are developing image processing capabilities to increase the efficiency of reviewing video to count fish (Hatch et al. 1998, Shortis and Otis 2014).

Elsewhere in the Pacific Northwest, researchers have been developing underwater video systems associated with partial weirs (Kucera and Faurot 2005, Gates and Palmer 2008, Kerkvliet and Booz 2015). Unmanned underwater systems are not practical for most Alaskan streams because the camera and weir would be vulnerable to high water events, inquisitive bears, and other mammals. So researchers in Alaska have been experimenting with manned (Hetrick et al. 2004) and unmanned video counting towers (Otis and Dickson 2002, O'Neal 2007, Otis 2012). Towers are more practical for unmanned, remote operation because there's nothing in the creek to obstruct fish passage or become vulnerable to bears or high water events. Unlike traditional counting towers, where human observers sample the escapement by counting fish during predefined periods every hour, video counting towers can be programmed to record fish passage continuously. Unmanned or autonomous video counting towers (AVCT) are well suited for many small clear streams that are otherwise monitored by aerial survey. When deployed at appropriate locations, AVCT's have demonstrated the ability to collect near census quality escapement estimates (Otis et al. 2010) that far surpass the accuracy of aerial survey indices.

OBJECTIVES

1. Operate AVCT's at Mikfik and Chenik lakes to census the daily escapement of sockeye salmon during daylight hours (approximately 0400–2400 hrs).
2. Provide Mikfik and Chenik lake escapement data to managers on a timely basis (e.g., $\leq$weekly) so it can be used for inseason management of commercial fisheries targeting those stocks.

Additional tasks to be accomplished:

1. Breach or remove beaver dams in Mikfik Creek that impede or preclude upstream migration of adult sockeye salmon trying to access Mikfik Lake.
2. Census the daily escapement of other species (e.g., coho salmon) entering Chenik Lake during daylight hours (approximately 0400-2400 hrs).
3. Record water depth and temperature hourly throughout video operations using a data logger deployed at each AVCT site.

METHODS

STUDY SITES

Currently, only two wild salmon stocks in the LCIMA are monitored using remote video, Mikfik Lake sockeye salmon and Chenik Lake sockeye salmon (Table 1). Both Mikfik and Chenik lakes are located in Kamishak District on the west side of Lower Cook Inlet (Figure 1). Mikfik Lake resides within the McNeil River State Game Sanctuary and Chenik Lake is located in the McNeil River State Game Refuge (Figure 2). Both lakes have relatively short (<5 km) outlet streams that drain into Kamishak Bay.

The remote video camera for the Mikfik Lake video system is located at the outlet of Mikfik Lake (59.083142 N, 154.274821 W). While this site is ideal for counting fish, it is not well suited to generating solar/wind power. Thus, the solar panels, wind generator, DVR, and batteries is located on a nearby peninsula on Mikfik Lake that has excellent exposure to the sun and laminar wind flows across the lake (59.082981 deg. N, 154.2782136 deg. W; Figure 3).

The Chenik Lake video system is located at the outlet of Chenik Lake (59.209422 deg. N, 154.189503 deg. W). This site is ideal for both counting fish and generating sufficient solar/wind power to sustain the video system's batteries so all the components of the video system are located together on the south side of the creek at the outlet of the lake (Figure 4). An added convenience of the Chenik site is the availability of a fisheries research cabin to store tools and equipment and house staff during site visits.

VIDEO COMPONENTS

The AVCT is comprised of several off-the-shelf electronic and video components attached to a custom fabricated aluminum quadrapod (hereafter referred to as the Quad) that can be erected streamside at a site conducive for counting fish and generating sufficient solar/wind power to operate the system (Figure 4). The Quad consists of four legs connected by a hinged top-bracket on which a wind generator mount is attached. Each leg consists of an 18 ' long, 2.5" diameter schedule 40 aluminum pipe, capable of being broken down into 2 or more pieces to accommodate transport to the field via small fixed-wing aircraft on floats (e.g., DeHavilland Beaver). A 0.5" tab of 3" flat stock aluminum 10" long is welded into a slot cut into the top of each leg. A 9/16" hole drilled into the center of each tab accommodates a ½" bolt to securely fasten the leg to a hinged top bracket. When erected, the legs of the Quad are approximately 4 m apart at the base, forming a stable foundation to support the 300 kg of equipment and materials mounted on it.

The sensitive electronic components are protected inside a bear and weather-proof aluminum strongbox (30 cm H x 1.2 m W x 1.1 m L) designed to sit atop a wooden platform secured approximately 2-m above ground on the Quad (Figures 4 and 5). The heart of the system is a

four-channel time-lapse digital video recorder (DVR; Everfocus EDSR400H) capable of being powered by direct current (DC) without requiring a DC/AC inverter. Setup of the DVR and viewing of remote cameras on site is facilitated by a 7" DC driven LCD monitor (*Supercircuits*).

Up to four remote cameras can be attached to the DVR via RG-6 coaxial cable terminated with BNC connectors. The primary camera (sky cam) is affixed to the top of the Quad with a field of view that encompasses the entire cross section of the creek, from bank to bank. The sky cam is comprised of a high-resolution, low-lux capacity color CCD camera (e.g., Supercircuits PC-33C) with a varifocal, auto-iris lens (e.g., 1.3-3.4 mm KOWA *LBVZ164A,* F1.4 lens at Chenik and 2.8-12 mm *SenkoPro TV4X2812D,* F1.2 lens at Mikfik). A circular polarizing filter (e.g., Prinz 37 mm) is affixed to the camera lens to ameliorate surface glare, which may otherwise make it impossible to consistently see fish underwater. Because the polarizing filter reduces the camera's ability to operate in low light conditions, we often deploy a second, low lux, black and white sky cam (e.g., Supercircuits PC-33B&W) without the polarizing filter to collect video during crepuscular periods when sun glare is not a concern. Both sky cams are protected inside commercially available weather proof camera housings (e.g., STI-7200K).

A high-contrast substrate panel comprised of a 4.6-mm (3/16") mesh beach seine is stretched across the stream bottom perpendicular to the channel to make it easier to see fish swimming past the AVCT (Figures 3 and 4). The net is dyed light green using RIT dye because early experiments suggested fish were sometimes reluctant to swim over a bright white panel. The upstream edge of the panel is secured to anchor chain (Mikfik) or 3.3 m lengths of 2.5 cm OD threaded steel pipe (Chenik) to create a straight edge and secure fixture for fastening the net to the bottom using Duckbill earth anchors (size DB-68). The downstream edge of the substrate panel is either weighted down with anchor chain along its length or left unencumbered to be pushed flat to the stream bottom by current.

Electronic components are powered by five 12 VDC, 100-Ah acid glass mat (AGM) batteries hooked up in parallel to provide a single 500 Ah capacity battery bank outputting 12VDC (Figure 5). We use 6.35 mm (0.25") thick by 50.8 mm (2") wide bronze or copper flat bar stock as common buss bars to link the batteries, finding they are faster and easier to deploy than conventional 2GA battery leads. Three-eighth inch holes are drilled through the flat bar at appropriate intervals to accommodate the threaded marine terminals of the batteries, which are secured by wing nuts once all wiring from the electrical components is attached. After all connections have been made, 1" pipe insulation is used to cover the positive and negative buss bars of the batteries to minimize the risk of shorting between the two.

Up to five solar panels (e.g., BP585U) and one wind generator (e.g., AirMarine 303) are used to generate power to recharge the battery bank. Each individual solar panel lead is run through a 15A fuse panel before going directly to the battery bank. To optimize output from the solar panels at Chenik Creek, we sometimes use a 12VDC 25A MPPT solar charge controller manufactured by Blue Sky Energy. The wind generator lead is run through a 40A circuit breaker before going directly to the battery bank. The internal voltage regulator on the wind generator is set to its maximum (17.2 V) to counteract line loss and maximize power generation during modest wind events. To avoid overcharging the batteries, at least one 40-amp charge control regulator (e.g., Trace C40 or Morningstar TS-45) is used to continuously monitor battery voltage and dissipate excess power as heat through 1 or 2 load dispersion devices (e.g., small heating element) whenever necessary. Because all electrical components are housed together on the

Quad, wire lengths are short and relatively small gauge wires can be used without concern for significant line loss.

All sensitive electronic components (e.g., DVR, LCD monitor, cameras) are protected by appropriate sized, slow-burn fuses inside a switched fuse panel, similar to those used for small boat accessories, so components can be individually powered down for maintenance. A ProStar-30 charge control regulator is used to monitor battery voltage, incoming power from the solar panels, and power drain from all system components. A custom-built "dashboard" fashioned out of 19 mm (¾") plywood provides a partition separating the batteries from sensitive electronic components as well as structure upon which various components and electrical wires can be hung (Figure 6).

VIDEO INSTALLATION, OPERATION, AND REMOVAL

Mikfik Lake

Due to the early run timing of Mikfik Lake sockeye salmon, installation of the Mikfik Lake video system should occur by May 20th, or as soon as possible thereafter when Mikfik Lake becomes ice-free and accessible by float plane. As depicted in Figure 3, the Mikfik Lake video system is comprised of two distinct parts. The video camera located at the lake outlet transmits images to the DVR located on the Quad several hundred meters away via a wireless transceiver system.

The Mikfik Lake video station is typically operated from late-May through early August. During the season, staff periodically swaps out the hard drive during regularly scheduled aerial surveys to monitor other stocks in Kamishak District. Early in the season, when timely information is needed to inform fishery management decisions, hard drives may be retrieved weekly. Once escapement is met and management decisions don't require timely information, hard drives generally aren't swapped until they're full (~ 3 weeks).

Removal of the Mikfik Lake video station usually occurs during the second week of August. To save money on charter flights, staff schedules the Mikfik removal to coincide with removing an experimental video system at McNeil River Falls. Staff gets dropped off at Mikfik Lake, remove that video station and then hike down to McNeil River to remove that system, facilitating servicing two projects with one drop-off and pick-up.

See Appendix A1 for a detailed description of how to install, maintain, and remove the Mikfik Lake video system.

See Appendix A2 for a detailed list of tools and equipment needed to install the Mikfik Lake video station, with reference to which ones are stored on site and those that need to brought from Homer.

Chenik Lake

The Chenik Lake sockeye salmon run typically begins in mid-late June and ends by mid-August. Installation of the Chenik Lake video system should occur no later than June 20th. Unlike the Chenik Lake station, the camera, DVR, and power generation equipment is all contained on a single Quad, which is located on the south shore of the outlet creek on the east end of Chenik Lake.

The Chenik Lake video station is typically operated from mid-late June through late-August. During the season, staff periodically swaps out the hard drive during regularly scheduled aerial surveys to monitor other stocks in Kamishak District. Early in the season, when timely information is needed to inform fishery management decisions, hard drives may be retrieved at least once a week. Once escapement is met and management decisions don't require timely information, hard drives generally aren't swapped until they're full (~ 3 weeks).

Removal of the Chenik Lake video station usually occurs during late-August or early-September. To save money on charter flights, staff tries to schedule either the drop-off or pick-up during a regularly scheduled aerial survey.

See Appendix B1 for a detailed description of how to install, maintain, and remove the Chenik Lake video system.

See Appendix B2 for a detailed list of tools and equipment needed to install the Chenik Lake video station, with reference to which ones are stored on site and those that need to brought from Homer.

VIDEO RECORDING AND REVIEW

We use a time-lapse recording rate of five frames per second to optimize hard drive space without compromising the reviewer's ability to track individual fish transiting the video site. The DVR compresses video into a proprietary motion-jpeg (MJPEG) format reviewable only on the manufacturer's DVR or hard drive reader. The DVR records in NTSC format at a resolution of 720x484 pixels and six different video compression qualities are available for selection (Lower, Low, Basic, Standard, High, and Superior). We've found that the "Low" quality setting provides sufficient resolution to see and count fish while minimizing the hard drive space required for a day's video. Because we do not use auxiliary lighting, there are approximately four hours each night (00:00-04:00) where it is too dark for the AVCT to see fish. Although disk space required for a day's video varies with the complexity of the images (e.g., varying light conditions, cloud shadows, etc.), the 250 and 320 GB hard drives we use typically accommodate 17 and 23 days of recorded video, respectively.

When current escapement information is required to inform inseason management, hard drives should be retrieved at least once/week and reviewed immediately. Video review takes place on a backup EDSR-400H hooked up to a 19" LCD monitor in the Homer Office (video room). A toggle dial on the DVR allows the reviewer to select the most appropriate review speed given the level of fish activity or non-activity. When no fish are present, reviewers are able to review an entire day in less than ten minutes. When fish are observed, the reviewer is able to quickly rewind to the first point fish appear and proceed at a slower pace conducive to counting. Additional record/review details can be found in the DVR manual.

Fish counts and other noteworthy observations (e.g., weather, dawn/dusk, video quality, and sightings of bears, moose, or other wildlife captured on video) get recorded in uniform MS Excel spreadsheets located on the Homer Local Area Network (LAN) at the following location (O:\DCF\SALMON\ESCAPEMENT\2017\VIDEO\). Separate files are maintained for each video project (e.g., 2017_Mikfik.xls, 2017_Chenik.xls). Observations are to be recorded in the spreadsheet tab named "Reviewer 1 Counts". Daily fish counts are stratified by species into 6-hr time blocks (e.g., 00:01-06:00, 06:01-12:00, 12:01-18:00, and 18:01-24:00). Staff also record

the amount of time required to review the video and any periods of video loss or other technical difficulties. See Appendix C for further details and an example of this spreadsheet.

ADDITIONAL GUIDELINES AND PROCEDURES

Safety

Employees deploying video systems at remote locations shall adhere to standard operating procedures (SOP) listed in relevant chapters/sections of ADF&G's SOP manual, including but not limited to Chapter 3, Section 700 (General Safety Policies/Procedures), to be found online at: http://intra.dfg.alaska.local/QRHome/Admin/QRAsops.html. Field staff working on this project shall maintain current First Aid/CPR certifications. New field staff shall participate in a bear/firearms safety class prior to going afield or carrying a firearm. Experienced field staff shall attend periodic bear/firearms safety refresher training. Access to Mikfik and Chenik lakes is by float plane only. Field staff participating in this project is encouraged to take Underwater Egress Training when available to become knowledgeable and proficient in escaping aircraft that have crash landed in water. Mikfik and Chenik lake are remote field sites so staff shall always carry emergency communications equipment capable of functioning effectively off-the-grid (e.g., VHF radio, satellite phone, or an emergency satellite beacon/texting device such as DeLorme inReach).

Maintenance

Staff are responsible for all in-season and post-season maintenance required to keep state equipment used on this project in good, serviceable condition. This includes but is not limited to all highway vehicles, radios, satellite phones/messaging devices, handheld computers, waders, boots, shotguns, cordless tools, hand tools, solar panels, wind generators, video cameras, digital video cameras, and other miscellaneous tools and equipment.

Compliance with ADF&G Regulations

All employees are responsible for complying with local subsistence, sport fishing, and hunting regulations. Copies of State and Federal regulations will be available in the Homer office and should be carried while conducting field work where the public is likely to be encountered. Violations will be recorded on employee evaluations and may be cause for immediate dismissal.

Violations

If a fishing violation is observed, all information pertaining to the violation should be recorded immediately and retained by the employee. The project leader must be notified. If you have a camera, record as much as possible.

The use of the five Ws can aid in obtaining sufficient information pertaining to a violation.

1. What is the violation?
2. When did the violation take place?
3. Where did the violation occur?
4. Who is in violation and who are the witnesses?
5. Why was the violation committed?

If the violator refuses to cooperate with an employee without enforcement authority, no action should be taken, other than to relay all information and evidence collected to the Project Leader, who will contact the appropriate law enforcement authorities.

Emergencies

In the event of a medical emergency, administer appropriate first aid to stabilize the situation. If an injury is life threatening, immediately call for emergency response using a device appropriate for the remote survey location (e.g., satellite phone, inReach satellite messenger, VHF radio). If using a satellite phone, call 911 or notify the US Coast Guard at 800-478-5555. The US Coast Guard can also be reached on SSB radio frequency 4.125 MHz or on VHF channel 16.

When contacting the U.S. Coast Guard, have the following information ready to pass along:

- Specific location of the emergency (latitude, longitude, if available),
- Name and phone number of supervisor,
- General nature of medical emergency,
- Number of patients,
- Specific information regarding the patient (name, age, primary complaint, and vital signs),
- Your assessment and treatment,
- Wind and weather conditions, and
- Other information pertinent to a possible medical evacuation.

SCHEDULE AND DELIVERABLES

1. Deploy Mikfik Lake video.
   Target date: On or around May 20 (or as soon as the ice melts on Mikfik Lake).
2. Deploy Chenik Lake video system.
   Target date: no later than June 20.
3. Periodically (e.g., weekly) retrieve hard drives from Mikfik and Chenik video systems and immediately review them to estimate current escapement levels.
   Target date(s): May 20– August 20.
4. Use current escapement counts to adjust time and area fishery openings/closures to assure the final escapement index falls within the respective escapement goal ranges for Mikfik and Chenik lake sockeye salmon.
   Target date: May 20–August 20.
5. Tally daily escapement counts to determine final escapement indices for Mikfik and Chenik lake sockeye salmon.
   Target date(s): October 1– November 15.
6. Publish daily and final escapement indices for Mikfik and Chenik lake sockeye salmon in the LCI Annual Management Report (AMR) and the statewide escapement goal report
   Target date(s): January 1–March 31.

RESPONSIBILITIES

LIST OF PERSONNEL AND DUTIES

Ted Otis, Fishery Biologist III, Project Leader. Budget manager, supervises field staff, directs data collection, analysis, and archival. Directs all phases of field site development, AVCT installation, and removal. Responsible for writing operational plans and assuring project results are published in the annual management report and statewide escapement goal report. Makes discretionary decisions concerning safety, methodology and collection of field data. Coordinates with the Area Management Biologist to assure project data are available for inseason management of commercial fisheries targeting Mikfik and Chenik lake sockeye salmon stocks.

Joe Loboy, Fishery Technician III. The project crew leader working under the supervision of the Project Leader. Is responsible for the installation, daily operation and removal of the AVCT's and associated equipment. Trouble shoots and repairs AVCT malfunctions, procures and fabricates equipment. Reviews video and records data as outlined in the operational plan. Ensures data is reviewed for completeness and is available for inseason management in a timely manner.

Tom Sigurdsson, Fishery Technician III. Assists with the installation and removal of the AVCT's. Reviews video and records data as outlined in the operational plan.

Patrick Houlihan, Fishery Technician II. Assists with the installation and removal of the AVCT's. Reviews video and records data as outlined in the operational plan

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TABLES

Table 1.–Sustainable escapement goals (SEG) for 12 chum, 18 pink, and 8 sockeye salmon stocks in Lower Cook Inlet, Alaska, year the goal was adopted, and the methods used to monitor them.

Species/Stock	Goal Type	Year Adopted	Escapement Goal Range			Monitoring Method			
			Lower	Mid	Upper	Aerial	Ground	Video	Weir
Chum Salmon (12)									
Port Graham River[1]	SEG	2017	1,200	1,950	2,700		x		
Dogfish Lagoon Creeks[1]	SEG	2017	3,500	6,050	8,600	x	x		
Rocky River[1]	SEG	2017	1,500	2,950	4,400	x			
Port Dick Creek[1]	SEG	2017	1,900	3,100	4,300	x	x		
Island Creek[1]	SEG	2017	5,100	8,500	11,900	x	x		
Big Kamishak River[1]	SEG	2017	6,800	11,200	15,600	x			
Little Kamishak River[1]	SEG	2017	8,000	12,400	16,800	x			
McNeil River[2]	SEG	2008	24,000	36,000	48,000	x			
Bruin River[1]	SEG	2017	5,200	7,600	10,000	x			
Ursus Lagoon Creeks[1]	SEG	2017	5,900	8,000	10,100	x			
Cottonwood Creek[1]	SEG	2017	5,200	8,700	12,200	x			
Iniskin River[1]	SEG	2017	5,900	9,750	13,600	x			
Pink Salmon (18)									
Humpy Creek[1]	SEG	2017	17,500	34,450	51,400		x		
China Poot Creek[1]	SEG	2017	2,500	4,400	6,300		x		
Tutka Creek[3]	SEG	2002	6,500	11,750	17,000		x		
Barabara Creek[1]	SEG	2017	2,000	3,800	5,600		x		
Seldovia River[1]	SEG	2017	21,800	29,600	37,400		x		
Port Graham River[1]	SEG	2017	7,700	13,700	19,700		x		
Dogfish Lagoon Creeks[1]	SEG	2017	800	3,950	7,100	x	x		
Port Chatham Creeks[1]	SEG	2017	7,800	12,950	18,100		x		
Windy Bay Right Creek[1]	SEG	2017	3,400	7,300	11,200	x			
Windy Bay Left Creek[1]	SEG	2017	5,400	16,250	27,100	x			
Rocky River[1]	SEG	2017	11,700	33,250	54,800	x			
Port Dick Creek[1]	SEG	2017	17,900	33,850	49,800	x	x		
Island Creek[1]	SEG	2017	9,600	21,050	32,500	x	x		
South Nuka Island Creek[1]	SEG	2017	2,800	7,000	11,200	x			
Desire Lake[1]	SEG	2017	1,500	9,750	18,000	x			
Bruin River[1]	SEG	2017	17,800	60,400	103,000	x			
Sunday Creek[1]	SEG	2017	4,400	14,650	24,900	x			
Brown's Peak Creek[1]	SEG	2017	2,600	10,050	17,500	x			
Sockeye Salmon (8)									
English Bay Lakes[3]	SEG	2002	6,000	9,750	13,500				x
Delight Lake[1]	SEG	2017	5,100	7,850	10,600	x			
Desire Lake[1]	SEG	2017	4,800	8,350	11,900	x			
Bear Lake[3]	SEG	2002	700	4,500	8,300				x
Aialik Lake[1]	SEG	2017	3,200	4,300	5,400	x			
Mikfik Lake[1]	SEG	2017	3,400	7,200	11,000			x	
Chenik Lake[1]	SEG	2017	2,900	8,300	13,700			x	
Amakdedori Creek[1]	SEG	2017	1,200	1,900	2,600	x			

Source: [1]Otis et al. 2016, [2]Otis et al. 2007; [3]Otis 2001

FIGURES

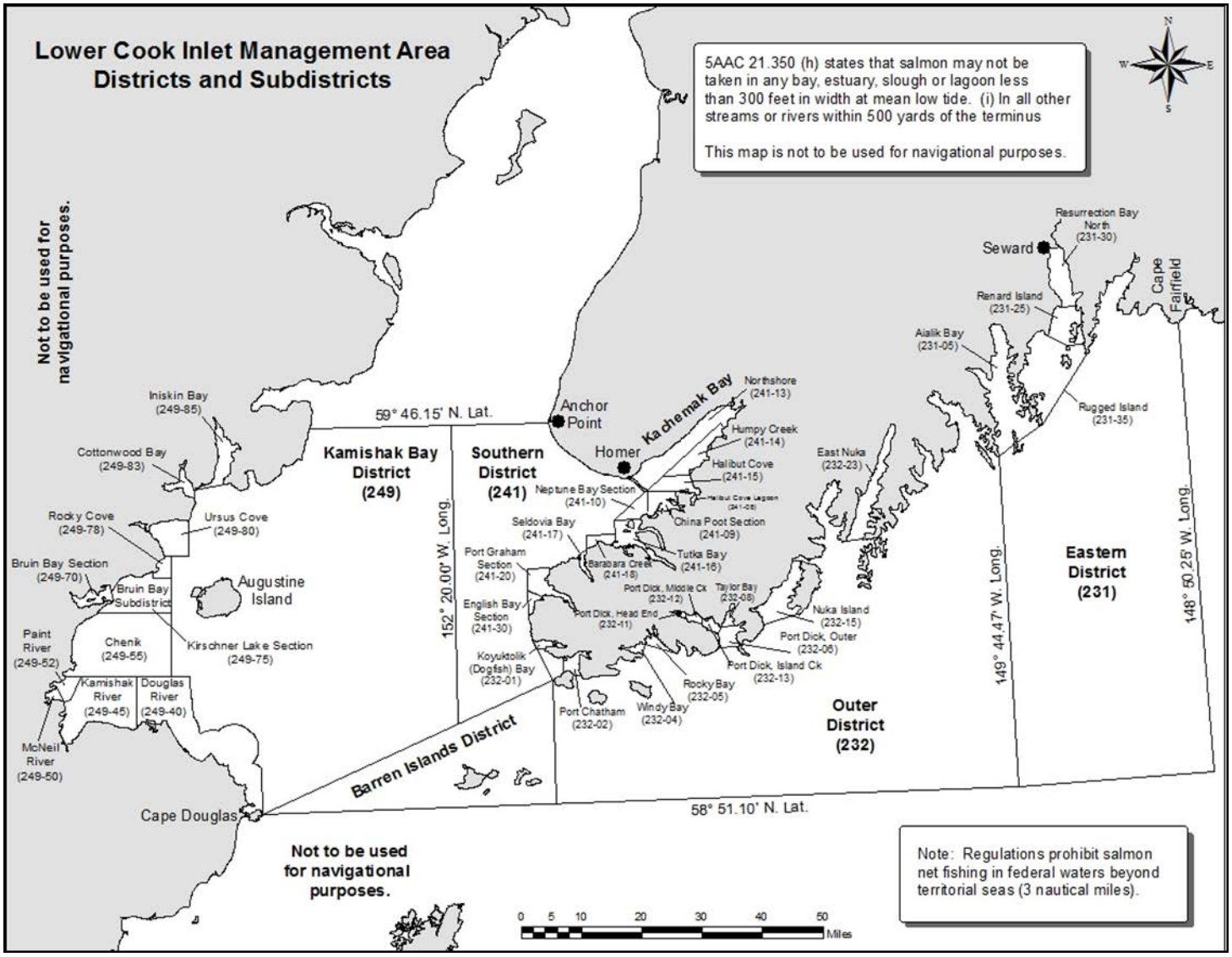


Figure 1.–Lower Cook Inlet commercial salmon management area showing commercial fishing district and subdistrict boundaries.

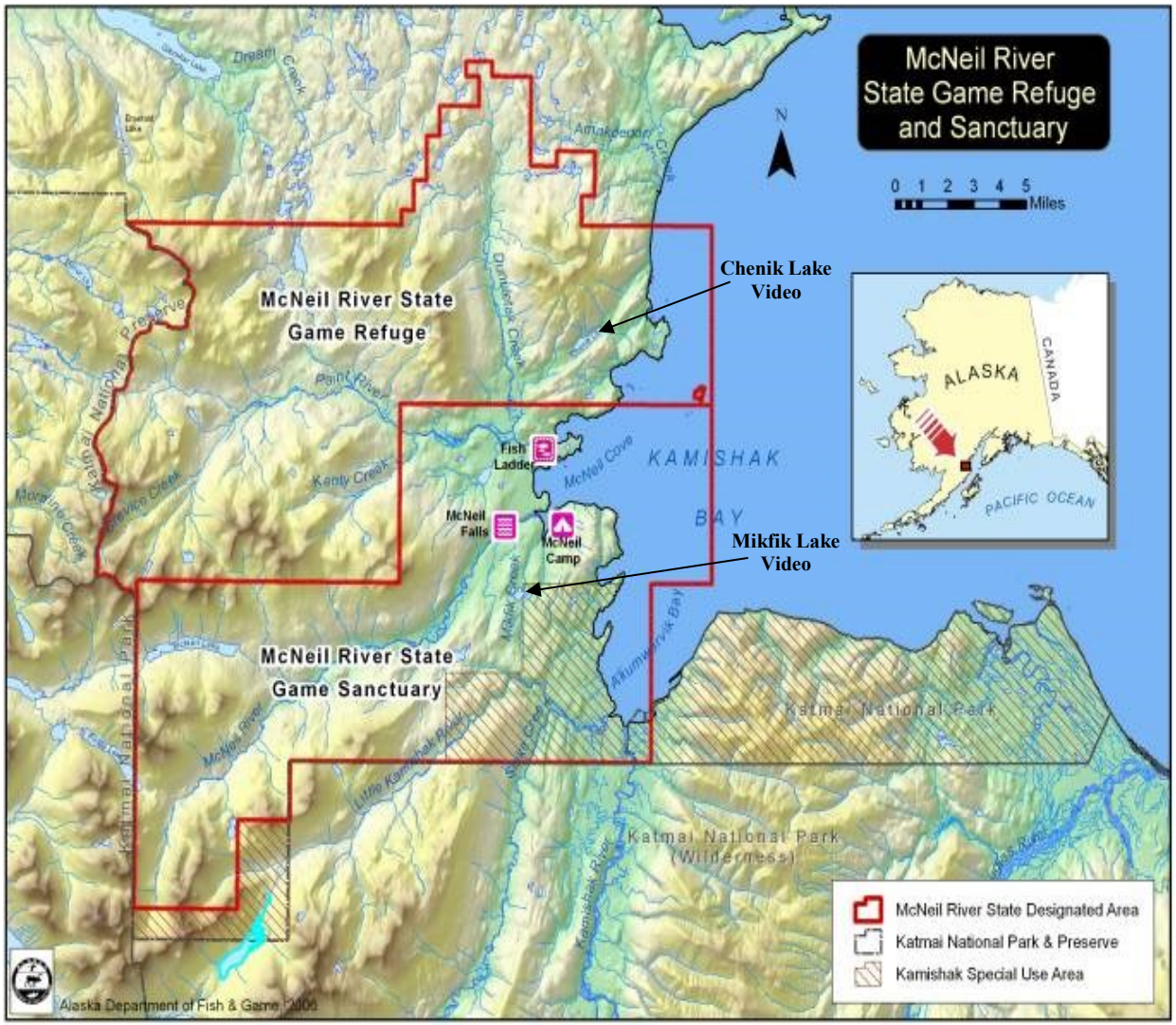


Figure 2.–Map illustrating the boundaries of the McNeil River State Game Sanctuary and Refuge and the locations of the Mikfik and Chenik Lake remote video salmon escapement monitoring projects.

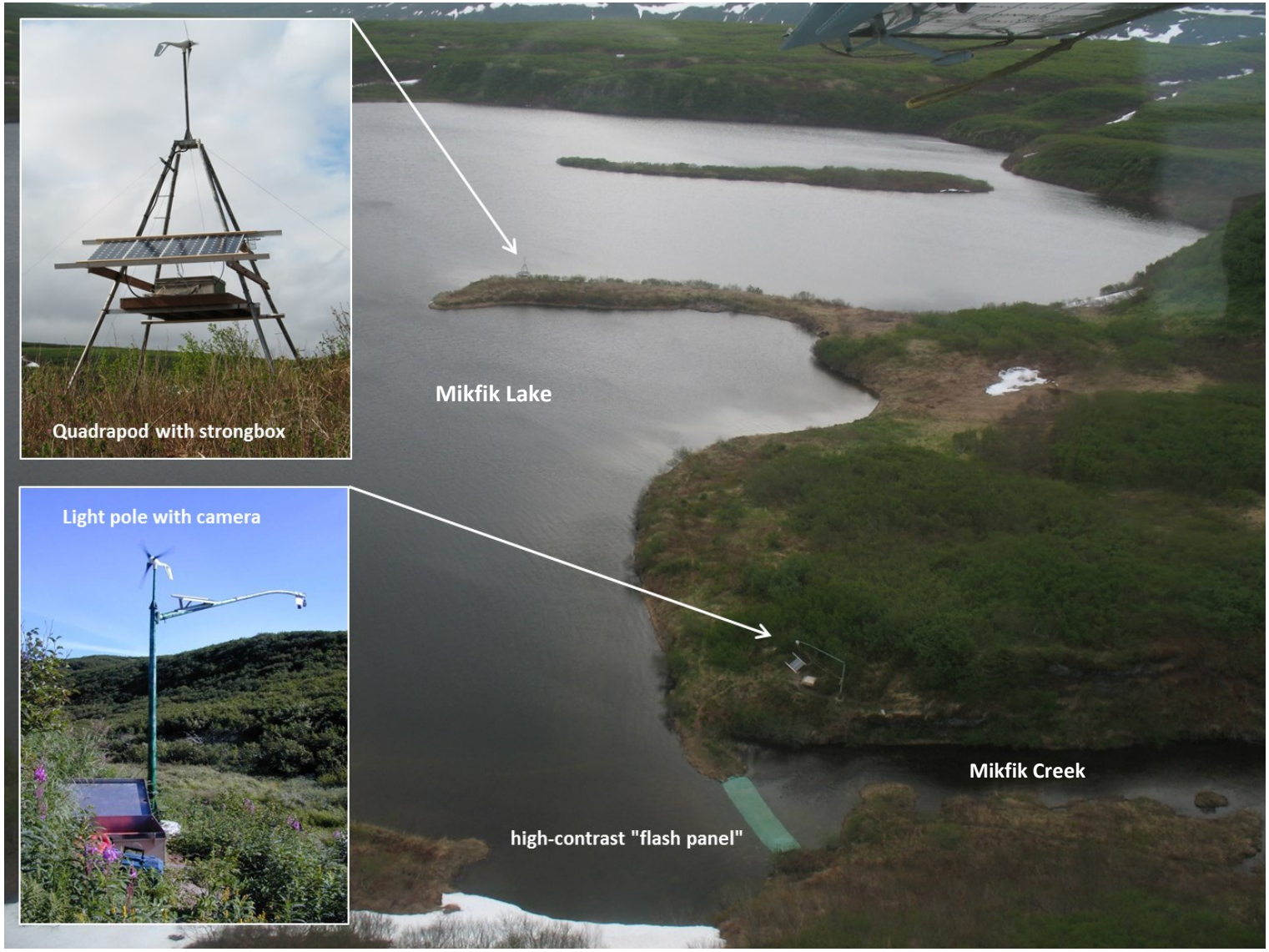


Figure 3.–Photographs illustrating various components of the remote video system used to monitor escapement of sockeye salmon into Mikfik Lake.

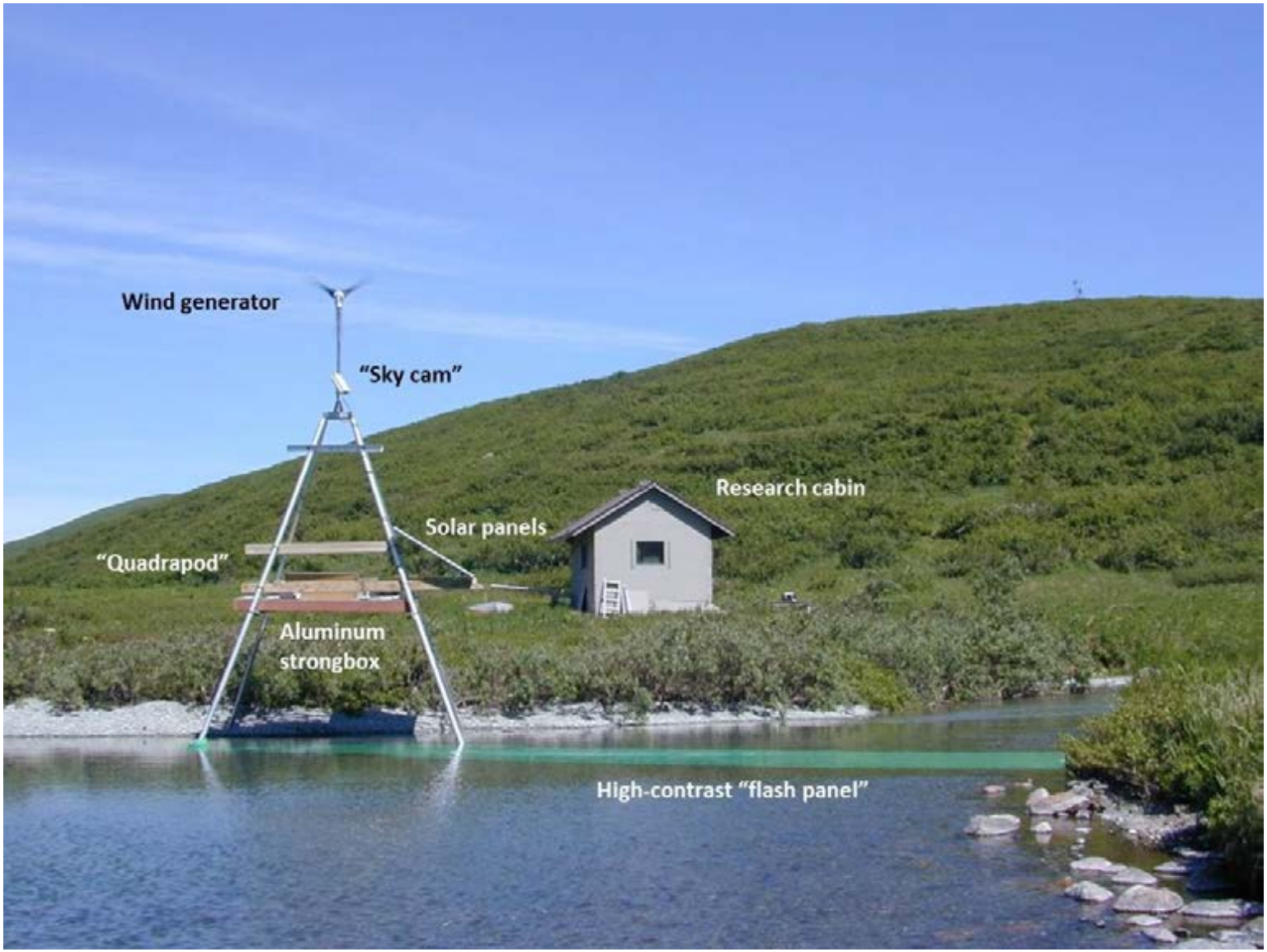


Figure 4.–Photograph illustrating various components of the remote video system used to monitor escapement of sockeye salmon into Chenik Lake (note: the Quad is now located on the south (opposite) side of the outlet creek to reduce surface glare).

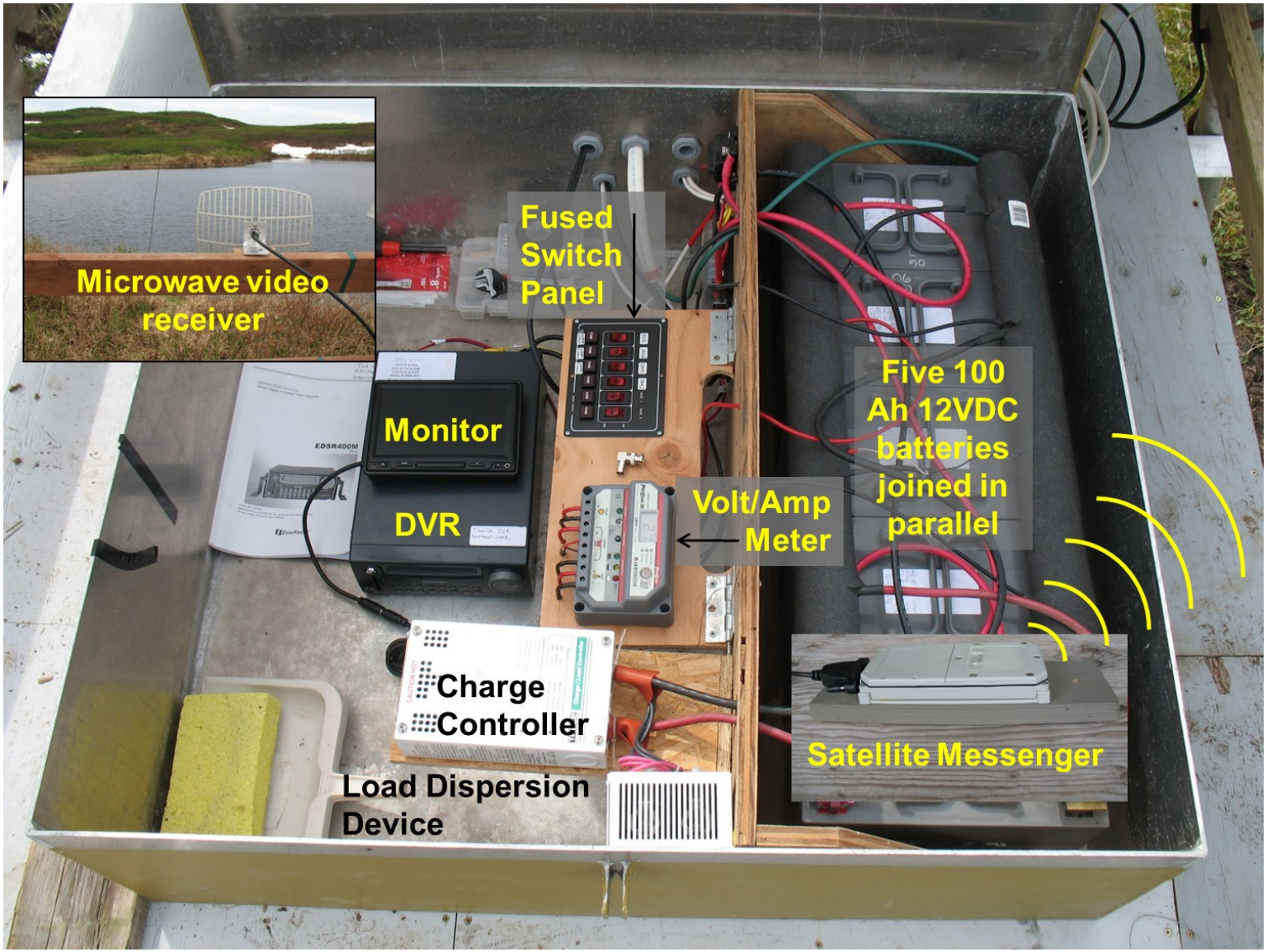


Figure 5.–Photograph illustrating the sensitive electronic components of the remote video system that are protected inside an aluminum strongbox.

Figure 6.–Photograph illustrating the wooden "dashboard" used to isolate the batteries from sensitive electronic components and to attach and organize wiring and electronic components of the remote video system.

APPENDIX A. INSTALLATION, OPERATION, AND REMOVAL OF MIKFIK LAKE REMOTE VIDEO STATION

Appendix A1.–Instructions for installing, maintaining, and removing the Mikfik Lake remote video salmon escapement monitoring station.

INSTALLATION

Due to the early run timing of Mikfik Lake sockeye salmon, installation of the Mikfik Lake video system should occur by May 20th, or as soon as possible thereafter when Mikfik Lake becomes ice-free and accessible by float plane. As depicted in Figure 1 below, the Mikfik Lake video system is comprised of two distinct parts. The video camera located at the lake outlet transmits images to the DVR located on the Quad several hundred meters away via a wireless transceiver system.

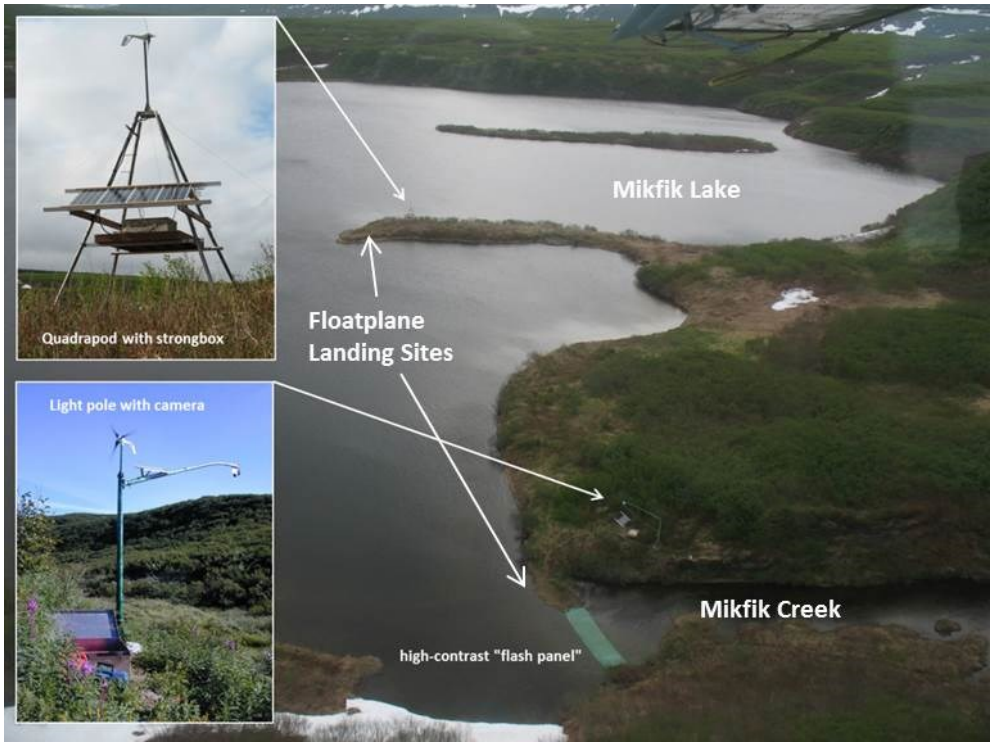


Figure 1. Photographs illustrating various components of the remote video system used to monitor escapement of sockeye salmon into Mikfik Lake.

Following is a general outline for installing the camera (outlet) and DVR/power generation (peninsula) stations at Mikfik Lake.

1. Pack all needed tools and equipment from the Homer office into plastic totes (see Appendix A2 for list of equipment typically stored overwinter in Homer). Separate items into totes based on whether they're needed at the camera site or the Quad site.
2. Charter a Cessna 206 on floats (e.g., Northwind Aviation) to transport gear and 2 people to Mikfik Lake around May 20th, or as soon as the lake becomes ice free. Note: if removal of a beaver dam is required, it's desirable for additional staff to come along to focus on that task while the AVCT is being installed.
3. Land on the East side of the tip of the peninsula near the Quad and offload the totes needed at that location (Fig 1). If there's a lot of equipment going to the outlet site (e.g.,

fresh batteries), ask the pilot to taxi people and gear to the outlet and offload tools/gear needed for that site.

4. Installation of the Mikfik video system takes 2 people at least 2.5 hrs if nothing goes wrong and up to 4 hrs if minor problems are encountered. Therefore it's more cost effective for the pilot to leave/return than to standby during installation. If the former option is chosen, allow 3-4 hrs on the ground before pickup so you don't have to rush.
5. At the lake outlet site, one person can spread the high-contrast "flash-panel" (stored on-site) out across the creek, securing the chain on the upper end to the seine cord attached to duckbill anchors previously driven into the substrate upstream. Use zip ties to patch minor tears in the netting. The panel runs from the tip of the small peninsula on the west side of the creek directly across to the opposite shore (see Fig 1). The stream width here is ~35'.
6. A water level and temperature data logger also gets installed at the creek outlet inside a standpipe (stored overwinter inside the creek-side strongbox). Use stainless bailing wire to attach the logger inside the standpipe and then clip the pipe to the middle duckbill anchor used to secure the substrate panel.
7. While one person is working on the flash panel and data logger, the other can remove items that were stored overwinter in the strongbox and begin hooking up the electrical components in the box (e.g., power to the camera and wireless video transceiver). The solar panel on the box lid was connected to a solid state charger all winter and can be left as is. The ProStar-30 charge control regulator is used to monitor battery voltage and feed power to the fused switch panel so draw load (amps) can be monitored. Power leads for the camera and video transceiver come out of the switched fuse panel, both of which are mounted on a plywood "dashboard" separating the controllers from the batteries (Fig 2).
8. Once the electrical connections are made, the camera needs to be hooked into the transceiver, which will be placed inside the Pelican case attached to the light pole. A collapsible ladder (stored on site in the creek-side strongbox) is used to access the Pelican case (Fig 3).
9. Before connecting the camera to the transceiver, verify that the remote camera has the proper field of view and focus (bank to bank with the panel centered on the screen) to document fish transiting the high-contrast flash panel. To do this, plug the BNC terminal from the camera (terminated inside the Pelican case; See Fig 4) into the AAA (3) battery-powered monocular and power up the camera using the fused switch panel inside the strong box (Fig 5). If the camera's field of view or focus is off, you'll need to make adjustments to the camera. If the camera view is OK, go to step 11.
10. To access the camera, you'll need to pivot the arm (Fig 6) of the light pole 90 degrees so it's facing uphill, secure the light pole at this angle, reposition the ladder to access the camera, and make the proper adjustments to the camera. Be sure to retighten the thumb screws on the lens once you've corrected the focus and zoom. Camera angle (up/down; left/right) are adjusted by slightly loosening the screws attaching the camera housing to the mounting bracket. Be sure to securely retighten these adjusting screws once proper camera orientation is achieved.
11. Once you've verified that the camera is oriented and focused correctly, reposition the arm of the light pole so it is parallel to the stream and reposition the ladder to access the Pelican case. Attach the female BNC fitting from the camera (terminated inside the Pelican case; Fig 4) to the male BNC fitting on the transceiver and plug/screw the power

jack into the transceiver. Place the transceiver back inside the Pelican case and arrange the small white disk antenna inside the case so it's pointing at the Quad. Make sure no wires get pinched when you close up the Pelican case. Have your partner power up the transceiver (at the fused switch panel) and verify that the proper LED lights illuminate confirming the transceiver powers up and goes to channel 1.

12. Verify wire connections are secure and all components (e.g., camera, transceiver) are powered up and operating correctly before closing up the strongbox at the creek site. Collect tools and hike over to the Quad to complete the setup there.
13. At the Quad site, one person can work on installing the solar panels and wind generator blades while the other opens the strongbox (combination is 8191) and hooks up the electronic components. The solar panels are stored in a cradle beneath the wooden deck of the Quad; they are labeled (e.g., center-left) so those with the longest cords are located farthest from the strong box. Orient the solar panels with their junction boxes facing up so wires are farther off the ground. A 5/16" allen wrench is needed to attach the hub to the wind generator, a 3/16" allen wrench is needed to attach the blades to the wind generator hub. The hub/blades are stored inside the box. A 5/32" allen wrench is needed to remove the wind generator from the quad tower, if needed.
14. Run the wires from the solar panels into the strong box and attach them to the solar fuse panel (Fig 7). Be sure working 15A fuses are in place where positive (+) solar leads are connected. Positive and negative leads from the solar fuse panel then run directly to the batteries. These should already be connected.
15. Three leads from the wind generator enter the strongbox and terminate at a 3-way switch that allows the user to "brake" the wind generator for servicing in windy conditions (Fig 8: switch up = operating; switch down = brake position). The negative lead from this switch goes directly to the negative terminal of a battery and the positive lead goes through a 40-amp marine circuit breaker and then to the positive terminal on a battery. To open the breaker (disconnecting the wind generator from the batteries), push the red button until a black bar swings out of the bottom of breaker. Be sure the breaker is closed (swing black bar back up into the body of the breaker until it clicks into place) before leaving the site if you want to use the wind generator to charge batteries. The wind generator leads should already be connected, so no wiring is needed here.
16. Power leads for the DVR, monitor, video transceiver, and video relay controller come out of the back of the switched fuse panel where each switch is labeled (Fig 9). Make sure each switch is in the "Off" position (Fig 5) and then connect the positive lead for each component to the appropriate device and make sure the negative lead for each device is connected to the negative buss bar on the "dashboard" (Fig 9).
17. Attach the microwave antenna dish (stored overwinter in the strongbox) to the 2x6 solar panel support bracket and make sure it's pointed at the transmitter on the light pole at Mikfik Creek (Fig 10). Run the large coax from the antenna into the strongbox and connect it to the small coax adapter and then to the Video In input to the video transceiver (Fig 11 and 12), same unit as used at the creek site. The adapter and small coax should have been stored in Homer with the transceiver over the winter and brought out with you to Mikfik.
18. Run power from the fused switch panel (Rx switch) to the power input on the video transceiver (Fig 12).

19. Use a 3' length of coax terminated with 2 female BNC's and connect one end to the video transceiver (Video Out terminal) and the other to the Video 1 input on the back of the DVR (Fig 11 and 12).
20. Plug the RCA input from the LCD monitor into the Main Monitor terminal on back of the DVR (you will need a female RCA to male BNC adapter to facilitate this; see Fig 11).
21. Verify that the positive and negative terminals from the wind generator/3-way switch go to opposite ends of the battery bank (essentially creates one big battery). Do the same for the solar panel leads (Fig 14). If possible, do the same for the major draws on the batteries (e.g., load dispersion device (aka toaster).
22. Verify that all wiring connections to the batteries are secure and the nuts are snugged down (be careful not to touch aluminum box with back end of wrench when tightening the positive terminals) using a 10-mm nut driver, wrench, or socket, which should be stored inside the strongbox). The batteries are Sunlyte 12-5000X with recessed threaded terminals that require an M6-1.00 x ¾" flange bolt to secure ring terminals to the battery.
23. Cover the long brass bars connecting the batteries with pipe insulation foam (Fig 14).
24. Arrange the DVR and monitor inside the box so the monitor can be viewed while accessing the control panel of the DVR (Fig 15).
25. Install new hard drive (320 GB or less) in the DVR. A key is required to lock/unlock the removable hard drive tray (Fig 16). The key should be left in the strongbox, but bring a spare, just in case.
26. Verify that the positive leads from all the components are connected to their respective switches on the fuse panel and that the negative leads are connected to the negative buss bar (Fig 9).
27. Power up the DVR, LCD monitor, Transceiver, and Video Relay (if Smart One is being used). Tap the power button on the monitor and verify that the DVR boots up correctly and defaults to programmed recording mode (P. Rec) or timed record mode (T Rec; Fig 17). If everything is working correctly, you should be able to see the video feed from the remote camera at Mikfik Creek.
28. Go into the menu on the DVR and verify that it is programmed correctly. If the DVR was in Programmed Record Mode when powered up, you'll need to hit the "STOP" button to access the menu, otherwise just hit the menu button (Fig 18). Use the inner toggle dial to cycle through the DVR setup and verify that it is in programmed record mode and is set to come on at 00:01 and turn off at 23:59. Refer to the DVR manual stored in a white binder in the strongbox for more details on programming the DVR.
29. Once the proper DVR settings have been verified, exit out of the menu by hitting the menu button. The DVR should default back to programmed record mode and immediately start recording. You can determine this by verifying that the light green hard drive light on the DVR control panel (2nd light of the two in the top left corner) is flashing (Fig 18). If the monitor does not include information about the hard drive (e.g., record mode, % of hard drive used), hit the display button on the DVR control panel until all these details are visible (Fig 17). Verify that the DVR is recording properly.
30. Assuming all components are functioning properly, turn off the monitor by switching it off at the fused switch panel (saves considerable power). Make sure the DVR and transceiver (Rx) remain powered on.
31. If the wind generator is turning and/or the sun is shining, use a clamp meter to verify that each is generating power and delivering it to the batteries (Fig 19). The wind generator

produces between 2-12 A at wind speeds between ~12-25 mph). If the wind generator is spinning but not producing power, verify that the 3-way switch is in the up (ON) position and the circuit breaker is closed. If sunlight is on the panels and they are not generating power (4 panels in direct sun should produce 15+ A; less when sun is obscured by clouds), replace the appropriate 15A fuse(s) in the solar fuse panel.

32. Close the box lid, assuring that no wires are pinched while doing so. Make sure all wires going to the batteries are routed through holes in the video dashboard (Figs 14 and 15). Wires routed over the top will get pinched by the box lid.
33. Secure box lid with a bolt/nut. Use electrical tape or bailing wire to secure excess solar panel wiring so it doesn't hang down where bears could access it.
34. Use plumbers putty to seal the holes where wiring enters the box (e.g., solar leads, wind generator lead, video coax; see Fig 20).

OPERATION AND MAINTENANCE

Operation and maintenance of the Mikfik remote video station during the season should consist of simply swapping out hard drives at appropriate intervals, not to exceed 3 weeks (much shorter if timely escapement information is needed for inseason management. Following are directions for swapping hard drives and minor troubleshooting if problems occur.

1. Open strongbox (Lock combo is 8191).
2. Read current battery voltage (as seen on the LCD of the Trace C40 at Mikfik or ProStar 30 Charge Control Regulator at Mikfik). Notify Ted later if voltage was below 12.3.
3. Verify Digital Video Recorder (DVR) is operating (the green power light on bottom right of the DVR and the green record AND yellow hard drive lights on top left of DVR should be lit; see Fig 18).
4. Power down the DVR using the switch labeled DVR on the fused switch panel (Fig 5).
5. Use the DVR hard drive (HD) key to unlock the DVR (lock is at top left of DVR) and pull the used HD out using the gray pull handle on the front of the HD (Fig 16).
6. Use firm pressure to slowly slide the new HD into the DVR HD slot until the face of the HD is flush with the face of the DVR and you feel the HD firmly "engage" with DVR.
7. Lock the HD in place using the key. Verify you cannot pull out the HD when locked.
8. Power up the DVR by flipping the switch labeled DVR on the fused switch panel.
9. Give the unit 20-30 seconds to boot up, then verify DVR is operating (the green power light on bottom right of the DVR and the green record light AND yellow hard drive lights on bottom left of DVR should all be lit). Also, check the monitor to verify you can see camera view and the appropriate display stats (e.g., % HR used, REC Rate, etc.).
10. If the monitor shows colored stripes (rainbow) instead of the camera view(s), and/or if green record light AND yellow hard drive lights do NOT come on after 30 seconds but DVR is powered up (green power light is on), you need to reboot the DVR by repeating steps 4-9. If the HD is not fully connected, the DVR cannot record. Repeat these steps until the monitor shows cam view(s) and the green record and yellow hard drive lights are on.

Troubleshooting:

Problem: Unit is not powered up and operating when box is opened.

Solution: Make sure the fuse panel switch for DVR is ON. Rock it back and forth a few times to make sure there's not just a bad connection at the switch. If that fails to turn the DVR on, use a

volt meter to confirm that the batteries have sufficient charge (>12.0) and that power is getting to the DVR terminals. If DVR is NOT receiving power to its terminals, turn DVR switch to OFF position and remove and check the fuse in the switch panel (spare fuses and small screwdriver to remove fuses should both be inside the strongbox; DVR uses 3A slow burn fuse). Replace fuse, even if it appears to be OK. Be sure switch is turned back to ON position. If there's still no power going to the DVR, make sure the wire feeding power from the batteries to the fused switch panel is firmly connected at both ends. Also, make sure that the wire feeding power from the fuse panel to the DVR terminals is firmly connected at both ends. Finally, confirm that the ground wires from both the DVR and the fused switch panel are firmly connected at both ends. If the fuse and all the wire connections are good and there's still no power to the DVR, either the fuse or the switch is bad. Run a continuity test on the fuse to confirm it's good. If it is, the switch may be bad. Either run a continuity test on the switch or try using one of the other open switches on the panel (remember to install a 3A slow burn fuse first, and plug the power line from the DVR into the new switch before turning it on). Use a voltmeter to confirm that power is successfully reaching the DVR.

If power is reaching the DVR terminals, but the unit still does not power up, the power supply board on the DVR has failed and needs to be replaced. Bring DVR back to Homer and swap in the spare DVR you brought with you (just in case).

VIDEO REMOVAL

Removal of the Mikfik video station typically occurs in early-mid August and coincides with the take-down of the experimental McNeil Falls video station. After taking down the Mikfik station, hike down to McNeil River to take down that station. This saves on air charters by allowing both stations to be removed with just one drop-off/pick up. Plan accordingly so minimal tools and equipment need to be carried between locations. Hiking down Mikfik Creek is difficult if the water is high and can be dangerous when a lot of fish and bears are in the creek. The best route to take between locations is via the small drainage that parallels Mikfik Creek to the East (aka "Joe's Creek"). You can easily hike along the north shore of Mikfik Lake to get over to this drainage. The total distance from Mikfik Lake to McNeil Camp is ~ 3.6 miles (Fig 21).

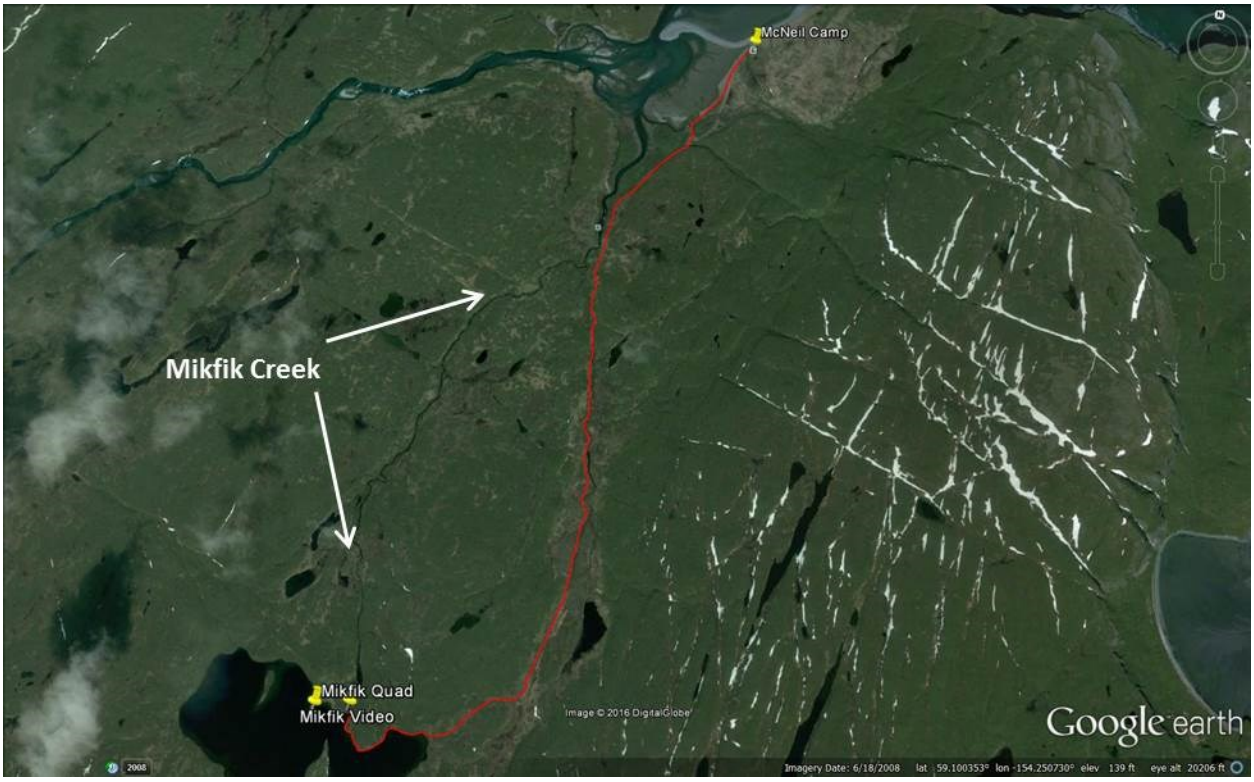


Figure 2. Route from Mikfik Lake to McNeil Camp via "Joe's Creek" drainage to the East of Mikfik Creek. Hike along the northwest shore of Mikfik Lake to access this route.

Removing the Mikfik video station is essentially the reverse of the installation process:

1. Pack tools needed for the Mikfik removal as well as a water-proof pack to carry sensitive electronic components (e.g., DVR, video transceivers) down to McNeil Camp. Most items are left overwinter in the strongboxes at the creek and peninsula sites.
2. Charter Cessna 206 on floats (e.g., Northwind Aviation) to transport gear and 2 people to Mikfik Lake around August 10th.
3. Land on the East side of the tip of the peninsula near the Quad and offload all gear at that location (Fig 1).
4. At the quad site, one person can work on removing the wind generator blades and all but one of the solar panels (see next step) while the other person opens the strongbox (combination is 8191) and disconnects the electronic components. A 5/16" allen wrench is needed to remove the hub from the wind generator. A 3/16" allen wrench is needed to remove the blades from the hub. The hub/blades are stored inside the box. Duct tape the cut plastic gallon jug (stored in box) to the front of the wind generator after removing the hub/blades (protects the shaft bearings from water intrusion over winter). Note: if the wind is blowing and you're worried about getting hit by the spinning blades, flip the 3-way switch in the box to the down position to "brake" the blades (Fig 8) or remove the 3 wind generator leads from the battery bank and connect them together so you can safely grab the tail of the wind generator and then turn it 90 deg to the wind so you can remove the blades without them turning.
5. One solar panel (the center one, which should be bolted to the brackets) is left up to maintain a charge on the batteries overwinter. Be sure leads from the solar fuse panel go

directly to the batteries and NOT through the Maximum Power Point Tracking device (MPPT), which is sometimes used to improve charging efficiency during summer.

6. Both toasters should remain hooked up to their respective charge controllers, which in turn should remain hooked up to the batteries to monitor their charge and divert excess input to the toasters.
7. Though it won't be operating through the winter, the wind generator stays in place and the wiring need not be disconnected. Simply push the red button on the breaker to disconnect the wind generator from the batteries.
8. Turn all the switches on the fused switch panel to "OFF". Disconnect the power leads from the back of the DVR and tape the bare ends with electrical tape. Disconnect the coax/power leads from the back of the LCD monitor (by disconnecting the plug close to the monitor). Disconnect the power jack plugged into the video transceiver and also those powering the video relay controller (if in use). Coil these wires up neatly and store them inside the box in a loosely sealed gallon Ziploc bag.
9. Remove the microwave antenna dish by unscrewing the antenna bracket from the wooden bracket it's secured to. Disconnect the large diameter coax from the junction to the small diameter coax (that connects to the video transceiver) and store the antenna and neatly coiled large diameter coax inside the strongbox. The small coax, adapter, and video transceiver should be boxed up and brought back to Homer.
10. Wrap up the 3' lengths of coax used to connect the video transceiver to the DVR and the DVR to the video relay controller and store them in the gallon zip lock.
11. If the "Smart One" was in use, unscrew the mount it's attached to and turn the unit off by removing the batteries so they don't corrode inside the unit over the winter. Put the Smart One, mounting bracket, cable, screws, and batteries into a gallon Ziploc bag to keep everything together for overwinter storage (typically back in Homer, but can overwinter in the strongbox).
12. To assure proper charging and load dispersion during winter, verify that all wiring connections to the batteries are secure and the wingnuts are snugged down (use crescent wrench for torque and be careful not to touch aluminum box with back end of wrench when tightening the positive terminals).
13. Re-cover the long brass bars connecting the batteries with pipe insulation foam (Fig 14).
14. Pack up the DVR and video transceiver in your waterproof bag and cushion them both for transport.
15. Neatly organize everything being stored overwinter inside the strongbox (e.g., LCD monitor, microwave antenna, wind generator hub and blades, etc. See Fig 21). Take a photo of the contents of the box and make note of anything that looks like it might need repair/replacement next season.
16. Use the clamp meter to verify that the lone solar panel is working and sending amperage from the solar fuse panel to the batteries (Fig 19).
17. Assuming all components are functioning properly, close up the strongbox, making sure no wires are pinched, and lock it.
18. Use plumbers putty to seal the wiring holes in the box (e.g., solar lead, wind generator lead, video coax; see Fig 20).
19. Pack up tools and gear and hike over to the Mikfik Creek camera site.
20. At the lake outlet site, one person can remove the high-contrast "flash-panel" and stack it on shore at the base of the path leading up to the light pole. They can also remove the

standpipe containing the data logger. Store the pipe in the strongbox and package the data logger for transport back to Homer. Check the integrity of the duckbill anchors and make note if any need to be replace next season.

21. While one person is working on the flash panel, the other can disconnect the electronic components (e.g., power to the camera and transceiver). If necessary, the solar leads should be disconnected from the ProStar-30 and reconnected to the solid state "winter" solar regulator, which in turn is connected to the two batteries linked in parallel so they get charged all winter.
22. The video camera can remain in place on the pole inside the weatherproof case, but the video transceiver needs to be removed. Use the collapsible ladder (stored on site in the creek-side strongbox) to access the Pelican case atop the light pole and remove the video transceiver (Fig 3). Box up the transceiver/antenna with some protective cushioning and add it to your pack to bring back to Homer.
23. To assure the batteries receive a charge from the solar panels overwinter, verify that wire connections between these devices are secure.
24. Close up the box and "lock" it with the bolts used to secure the lid.
25. Collect tools and equipment and hike along the northeast shore of Mikfik Lake to access the upper drainage of "Joe's Creek" and follow the drainage down to where it joins Lower Mikfik Creek, then hike over to the McNeil camp (see Fig 2 above for map with route).

Appendix A2.–List of tools and equipment needed to install the Mikfik Lake video station, with reference to those stored on site and those that need to be brought from Homer.

Mikfik 2016

Installation Date:					**:Removal Date**
Installation Start Time:					**:Removal Start Time**
Installation Complete Time:					**:Removal Complete Time**
Total Hrs:					**:Total Hrs**
Install Personnel:			**Removal Personnel:**		
	Qty	**Weight**	**Category**	**On site?**	**Comments**
IN FIELD					
Camera site					
anchor chain	2		priority	**x**	at outlet, still attached to flash-panel netting
solar panel mounting brackets	2		priority	**x**	permanently attached to top of creekside strongbox
Solar panel	1		priority	**x**	permanently attached to top of creekside strongbox
flashpanel	1		priority	**x**	at outlet (unroll then accordion across) chain still attached
Threaded pipe and cap	1		priority	**x**	in box
remote camera, high res color w polarizer	1		priority	**x**	left on pole; **BRING SPARE**
remote camera mount (attached to camera)	1		priority	**x**	on pole
remote camera cable	1		priority	**x**	on pole, runs insde pole then underground and into strongbox
Pelican case for transmitter	2		priority	**x**	on pole
video "dashboard"	1		priority	**x**	in box
Typar	1		priority	**x**	in box; used to impede vegetatative grown around solar panel
Telescoping Ladder	1		priority	**x**	in box
1 1/8" combination wrench	1		priority	**x**	in box; used to loosen/tighten bolts at base of pole
matched pair of wrenches 15/16"	2		priority	**x**	in box; used to loosen/tighten bolts to pivot light pole
snatch block	7		priority	**x**	in box; used to raise/lower the light pole when necessary
dustpan/brush	1		priority	**x**	Handle taped to mast; used to clean substrate panel
spare fuses, asst'd	1		priority	**x**	in box (at both sites)
weed whacker	1		priority	**x**	in box; used to clear vegetation from around the solar panel
Tarp (for wiring box in rain)	1		priority	**x**	in box
12 V batteries	2		priority	**x**	Now left at creekside strongbox overwinter for charging
Quad site					
12 V batteries	5		priority	**x**	Have a full set charged and staged for quick replacement
Buss bars to link batteries	2		priority	**x**	in box
Micro-wave receiver antenna	1		priority	**x**	in box; **MAY NEED REPAIR**
video "dashboard"	1		priority	**x**	Leads to batteries disconnected for winter
Solar Panels	4		priority	**x**	1 left up for winter, 3 stored under the Quad deck w leads
power cord for solar panels	1		priority	**x**	attached to solar panels
wind generator w cable	1		priority	**x**	Gallon jug nose cone; nut on shaft; Breaker tripped; BRAKE off
WG blades and hub	1		priority	**x**	in box, 1or 2 blades removed so it fits atop batteries
charge control regulator, Trace C40	2		priority	**x**	in box; remains active through winter
load dispersion device (toaster)	2		priority	**x**	in box; remains active through winter
dustpan/sponge	1		priority	**x**	in box
Video Relay Controller	1		priority	**x**	in box; missing at least one screw for inputs; but functional
LCD monitor w cables	1		priority	**x**	in box; still hooked up to switch panel (NOT SURE)
spare fuses, asst'd	1		priority	**x**	in box
Tarp (for wiring box in rain)			priority	**x**	in box
jumpers for overwinter charge			priority	**x**	in box (no longer needed)

Appendix A2. Page 2 of 2.

Mikfik 2016

Installation Date:					**:Removal Date**
Installation Start Time:					**:Removal Start Time**
Installation Complete Time:					**:Removal Complete Time**
Total Hrs:					**:Total Hrs**
Install Personnel:			**Removal Personnel:**		
	Qty	**Weight**	**Category**	**On site?**	**Comments**
IN TOWN					
Smartone wire harness	1	0	priority		Consider leaving on site Standardize with Chenik
Allen wrenches for wind generator	2		priority		(should be left in a kit / bring and leave)
Multi screw driver	1		priority		(should be left in a kit / bring and leave)
Adjustable wrenches	2		priority		(should be left in a kit / bring and leave)
Electrical tape	1		priority		(should be left in a kit / bring and leave)
Side cutter	1		priority		(should be left in a kit / bring and leave)
Wire stripper	1		priority		(should be left in a kit / bring and leave)
Asst ends, connectors, shrink tube, wire	1	1	priority		(should be left in a kit / bring and leave)
Small Butane torch	1	1	priority		(should be left in a kit / bring and leave)
Plumbers putty	1	1	priority		(should be left in a kit / bring and leave)
Asst. screws and SS bolts	1	2	priority		(should be left in a kit / bring and leave)
Duck bill driver (rebar, size for #68 DBs)	1	4	priority		(should be left in a kit / bring and leave)
Duckbills (#68)	3	2	priority		(should be left in a kit / bring and leave)
Zip ties (6-8" long but skinny, maybe 1/8")	100		priority		(should be left in a kit / bring and leave)
Pair of VHF radios	2	1	priority		Should always bring on install
Monocular with RCA to BNC adapter	1	1	priority		Should always bring on install
digital camera w spare batteries (or phone)	1	1	priority		Should always bring.
DVR (Pre-Programmed for Mikfik)	1	8	priority		Consider leaving on site
hard drive (up to 320 GB)	1	1	priority		
WL/Temp data logger	1	1	priority		(bring SS wire to hang from standpipe cap)
Transmitter & Receiver Units	2	10	priority		check connections for integrity and continuity
SAT phone and/or DeLorme inReach	1	3	Required		for emergencies and communicaiton with pilot
12 GA shotgun w slugs/Bear Spray	1	10	Required		
bug-dope and/or bug jackets	2	1	priority		
raingear	2	5	priority		
waders	2	10	priority		
food	2	5	priority		
water and filter	2	5			
work gloves	2	1	optional		
18V cordless drill and spare battery	1	6	optional		Optional; depends on work tasks
drill bits (must include sharp > 3/8" bit)	1	4	optional		Optional; depends on work tasks
sunglasses	2	1	optional		
Clamp-meter	1	2	priority		to check amperage
Battery Tester	1	1	priority		to check battery storage capacity
Person #1	Ted	200	priority		
Personal pack #1	Ted	20	optional		
Person #2	Joe	200	priority		
Personal pack #2	Joe	20	optional		
People		400			
Gear		125			

APPENDIX B. INSTALLATION, OPERATION, AND REMOVAL OF CHENIK LAKE REMOTE VIDEO STATION

Appendix B1.–Instructions for installing, maintaining, and removing the Chenik Lake remote video salmon escapement monitoring station.

INSTALLATION

Installation of the Chenik Lake video system should occur no later than June 20th. As depicted in Figure 1, the Chenik video station is self-contained on a Quad located at the outlet of the lake. A Fish and Game research cabin at the site provides secure overwinter storage for video components and a convenient place to stay during overnight visits for maintenance.

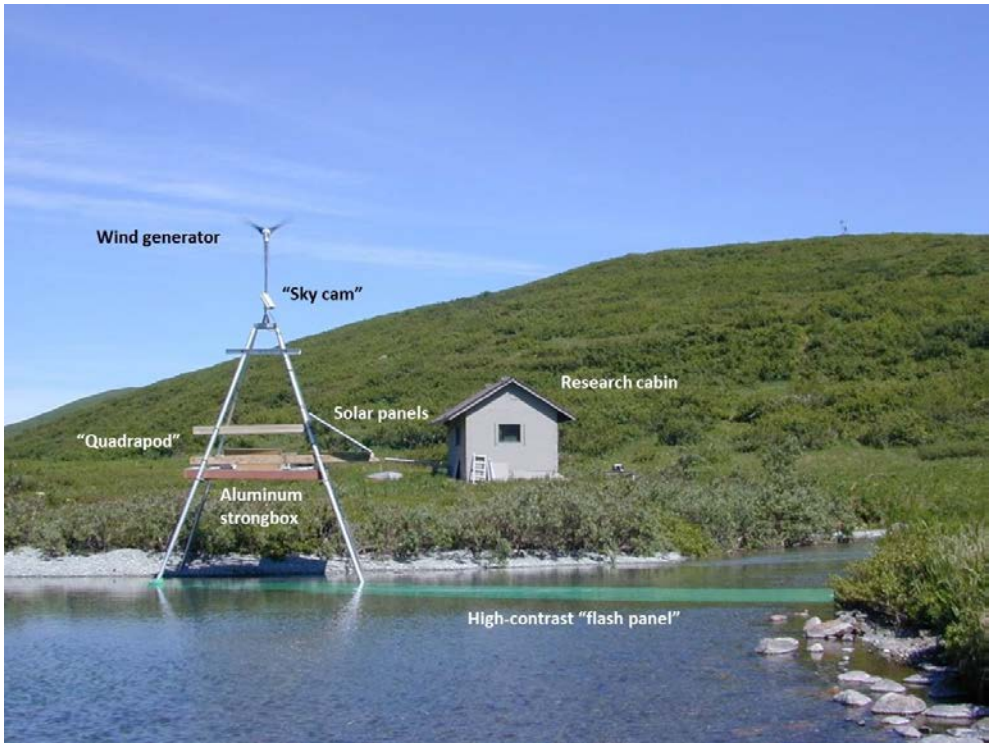


Figure 1. Photograph illustrating various components of the remote video system used to monitor escapement of sockeye salmon into Chenik Lake. Note: the Quad is now located on the opposite (south) side of the outlet creek.

Following is a general outline for installing the video station at Chenik Lake.

1. Pack all needed tools and equipment from the Homer office into plastic totes (see Appendix B2 for list of equipment typically stored overwinter in Homer).
2. Charter Cessna 206 on floats (e.g., Northwind Aviation) to transport gear and 2 people to Chenik Lake no later than June 20th.
3. Land at east side of Chenik Lake, about 100 meter north of the outlet creek, offload gear and haul it up to the cabin. There is no lock on the cabin.
4. Installation of the Chenik video system takes 2 people a few hrs if nothing goes wrong, longer if problems are encountered. Therefore it's more cost effective for the pilot to leave/return than to standby during installation. Given the convenience of the cabin, we typically schedule 1 overnight with a pickup the following day. Cabin maintenance should be conducted with any surplus time on site. If possible, coordinate the drop-off or

pick-up to coincide with a regularly scheduled aerial survey to reduce dedicated charter costs.

5. The high-contrast "flash-panel" is typically stored in the cabin. One person can start spreading this out on the beach and attaching it to the metal pipe used as the upstream leading edge. The pipe is stored overwinter in the willows on the north side of the creek outlet. Use zip ties to secure the net to the pipe and to repair holes in the panel. Two people will be needed to walk the pipe/panel out across the outlet of the creek and secure it to the seine cord attached to duckbill anchors previously driven into the substrate at the lake outlet. The panel lays directly across the creek bottom at the lake outlet (see Fig 22).
6. A water level and temperature data logger also gets installed at the lake outlet inside a standpipe (stored overwinter in the loft of the cabin). Use a sledge hammer (stored underneath the west side of the cabin) to drive the standpipe into the streambed next to the 2nd duckbill anchor from the Quad side of the creek. Once the pipe is securely driven so about 1 foot remains above the streambed, unscrew the cap and use stainless steel bailing wire to hang the data logger from the cap. When the cap is replaced the logger hangs down inside the standpipe and rests on the streambed.
7. While one person is working on the flash panel and data logger, the other can begin removing the single solar panel used to charge the batteries over the winter. Use a cordless drill/driver to unscrew the bracket securing the solar panel to the deck behind the strongbox. With that removed the panel can be moved and the strongbox can be opened (the combination to the lock is 8191).
8. Disconnect the "winter" solar panel wiring from the solar fuse panel and coil the wire up for summer storage of the panel and wire in the cabin loft.
9. Two people are needed to carry the "summer" solar panels, already secured together in aluminum angle brackets, from their winter storage in the cabin over to the Quad. With one person on the Quad deck and the other on the ground, lift the solar panel array up into place and secure it to the metal brackets at the end of the four wooden 2x6 boards secured above the Quad deck (Fig 23).
10. Run the wires from the solar panels into the strong box and attach them to the solar fuse panel (Fig 7). Be sure working 15A fuses are in place where positive (+) solar leads are connected. Positive and negative leads from the solar fuse panel then run directly to the batteries. These should already be connected.
11. If the Smart One satellite messenger is going to be used, activate the unit and mount it to the 2x6 solar panel support arm (Fig 23), run the wires inside the box and terminate them at the video controller relay according to Fig 13.
12. Attach the wind generator hub/blades (stored inside the box or loft of cabin) onto the wind generator. A large allen wrench is needed to keep the shaft from turning while you spin the blades to tighten the retaining nut.
13. Three leads from the wind generator enter the strongbox and terminate at a 3-way switch that allows the user to "brake" the wind generator for servicing in windy conditions (Fig 8: switch up=operating; switch down=brake position). The negative lead from this switch goes directly to the negative terminal of a battery and the positive lead goes through a 40-amp marine circuit breaker and then to the positive terminal on a battery. To open the breaker (disconnecting the wind generator from the batteries), push the red button until a black bar swings out of the bottom of breaker. Be sure the breaker is closed (swing black bar back up into the body of the breaker until it clicks into place) before

leaving the site if you want to use the wind generator to charge batteries. The wind generator leads should already be connected, so no wiring is needed here.

14. Power leads for the DVR, monitor, 2 cameras, and video relay controller come out of the back of the switched fuse panel where each switch is labeled (Figs 8 and 9). Make sure each switch is in the "Off" position (Fig 5) and then connect the positive lead for each component to the appropriate device (e.g., DVR, Monitor, Cam 1, Cam 2, Video Relay) and make sure the negative lead for each device is connected to the negative buss bar on the "dashboard" (Fig 9).
15. Connect the coax inputs from the two video cameras to the BNC video input terminals on the back of the DVR (Fig 11; color camera goes to Video 1 and black and white goes to Video 2).
16. Run a 3' length of coax from the Video Call monitor on back of the DVR over to the "Input" terminal on the video controller relay (Figure 13; Note: this is only necessary if you are hooking up the "Smart One" satellite messenger to send email alerts if/when video is lost. If the "Smart One" is not being used, then you don't need the video relay controller).
17. Plug the RCA input from the LCD monitor into the Main Monitor terminal on back of the DVR (you will need a female RCA to male BNC adapter to facilitate this; see Fig 11).
18. Verify that the positive and negative terminals from the wind generator/3-way switch go to opposite ends of the battery bank (essentially creates one big battery). Do the same for the solar panel leads (Fig 14). If possible, do the same for the major draws on the batteries (e.g., load dispersion device (aka toaster)).
19. Verify that all wiring connections to the batteries are secure and the wingnuts are snugged down (use crescent wrench for torque and be careful not to touch aluminum box with back end of wrench when tightening the positive terminals).
20. Cover the long brass bars connecting the batteries with pipe insulation foam (Fig 14).
21. Arrange the DVR and monitor inside the box so the monitor can be viewed while accessing the control panel of the DVR (Fig 15).
22. Install new hard drive (320 GB or less) in the DVR (requires a key to lock/unlock the removable hard drive tray; see Fig 16).
23. Verify that the positive leads from all the components are connected to their respective fused switch panels and the negative leads are connected to the negative buss bar (Fig 9).
24. Power up the DVR, LCD monitor, cameras 1 and 2, and the Video Relay (if Smart One is being used). Tap the power button on the monitor and verify that the DVR boots up correctly and defaults to programmed recording mode (Fig 17). If everything is working correctly, you should be able to see the video feed from the two cameras.
25. Make sure the cameras are focused sharply and oriented properly at the flash panel so they see bank to bank (and beyond for the black and white camera, which shows the whole east side beach of Chenik Lake where floatplanes land). Make any adjustments needed by loosening the screws securing the camera housing to the bracket and repositioning the camera before re-tightening the screws.
26. Once the cameras are positioned and focused properly, go into the menu on the DVR and verify that it is programmed correctly. If the DVR was in Programmed Record Mode when powered up, you'll need to hit the "STOP" button to access the menu, otherwise just hit the menu button (Fig 18). Use the inner toggle dial to cycle through the DVR setup and verify that it is in programmed record mode and is set to come on at 00:01 and

turn off at 23:59. Refer to the DVR manual that's stored in a white binder in the strongbox for more details on programming the DVR.

27. Once the proper DVR settings have been verified, exit out of the menu by hitting the menu button. The DVR should default back to programmed record mode and immediately start recording. You can determine this by verifying that the light green hard drive light on the DVR control panel (2nd light of the two in the top left corner) is flashing (Fig 18). If the monitor does not include information about the hard drive (e.g., record mode, % of hard drive used), hit the display button on the DVR control panel until all these details are visible (Fig 17). Verify that the DVR is recording properly.
28. Assuming all components are functioning properly, turn off the monitor by switching it off at the fused switch panel (saves considerable power). Make sure the DVR, cameras, and video relay controller (only if Smart One is in use) all remain powered on.
29. If the wind generator is turning and/or the sun is shining, use a clamp meter to verify that each is generating power and delivering it to the batteries (Fig 19). If the wind generator is spinning but not producing power, verify that the 3-way switch is in the up (ON) position and the circuit breaker is closed. If sunlight is on the panels and they are not generating power, replace the appropriate 15A fuse(s) in the solar fuse panel.
30. Close the box lid, assuring that no wires are pinched while doing so. Make sure all wires going to the batteries are routed through holes in the video dashboard (Figs 14 and 15). Wires routed over the top will get pinched by the box lid.
31. Secure the combination lock. Use electrical tape or bailing wire to secure excess solar panel wiring so it doesn't hang down where bears can access it (Fig 23).
32. Use plumbers putty to seal the holes where wiring enters the box (e.g., solar leads, wind generator lead, video coax; see Fig 20).

OPERATION AND MAINTENANCE

Operation and maintenance of the Chenik remote video station during the season should consist of simply swapping out hard drives at appropriate intervals, not to exceed 3 weeks (much shorter if timely escapement information is needed for inseason management. Following are directions for swapping hard drives and minor troubleshooting if problems occur.

1. Open strongbox (Lock combo is 8191).
2. Read current battery voltage (as seen on the LCD of the Trace C40 at Mikfik or ProStar 30 Charge Control Regulator at Chenik). Notify Ted later if voltage was below 12.3.
3. Verify Digital Video Recorder (DVR) is operating (the green power light on bottom right of the DVR and the green record AND yellow hard drive lights on top left of DVR should be lit; see Fig 18).
4. Power down the DVR using the switch labeled DVR on the fused switch panel (Fig 5).
5. Use the DVR hard drive (HD) key to unlock the DVR (lock is at top left of DVR) and pull the used HD out using the gray pull handle on the front of the HD (Fig 16).
6. Use firm pressure to slowly slide the new HD into the DVR HD slot until the face of the HD is flush with the face of the DVR and you feel the HD firmly "engage" with DVR.
7. Lock the HD in place using the key. Verify you cannot pull the HD out when locked.
8. Power up the DVR by flipping the switch labeled DVR on the fused switch panel.
9. Give the unit 20-30 seconds to boot up, then verify DVR is operating (the green power light on bottom right of the DVR and the green record light AND yellow hard drive lights

on bottom left of DVR should all be lit). Also, check the monitor to verify you can see camera view and the appropriate display stats (e.g., % HR used, REC Rate, etc.).

10. If the monitor shows colored stripes (rainbow) instead of the camera view(s), and/or if green record light AND yellow hard drive lights do NOT come on after 30 seconds but DVR is powered up (green power light is on), you need to reboot the DVR by repeating steps 4-9. If the HD is not fully connected, the DVR cannot record. Repeat these steps until the monitor shows cam view(s) and the green record and yellow hard drive lights are on.

Troubleshooting:

Problem: Unit is not powered up and operating when box is opened.

Solution: Make sure the fuse panel switch for DVR is ON. Rock it back and forth a few times to make sure there's not just a bad connection at the switch. If that fails to turn the DVR on, use a volt meter to confirm that the batteries have sufficient charge (>12.0) and that power is getting to the DVR terminals. If DVR is NOT receiving power to its terminals, turn DVR switch to OFF position and remove and check the fuse in the switch panel (spare fuses and small screwdriver to remove fuses should both be inside the strongbox; DVR uses 3A slow burn fuse). Replace fuse, even if it appears to be OK. Be sure switch is turned back to ON position. If there's still no power going to the DVR, make sure the wire feeding power from the batteries to the fused switch panel is firmly connected at both ends. Also, make sure that the wire feeding power from the fuse panel to the DVR terminals is firmly connected at both ends. Finally, confirm that the ground wires from both the DVR and the fused switch panel are firmly connected at both ends. If the fuse and all the wire connections are good and there's still no power to the DVR, either the fuse or the switch is bad. Run a continuity test on the fuse to confirm it's good. If it is, the switch may be bad. Either run a continuity test on the switch or try using one of the other open switches on the panel (remember to install a 3A slow burn fuse first, and plug the power line from the DVR into the new switch before turning it on). Use a voltmeter to confirm that power is successfully reaching the DVR.

If power is reaching the DVR terminals, but the unit still does not power up, the power supply board on the DVR has failed. Swap in the spare DVR you brought with you (just in case), and bring the failed DVR back to Homer for repair.

VIDEO REMOVAL

Removal of the Chenik video station typically occurs in mid-late August. Similar to the installation, try to coordinate either the drop-off or pick-up with a regularly scheduled aerial survey flight to save on air charter costs. Additional time provided by an overnight stay can be used to conduct routine maintenance needed on the Chenik cabin.

Removing the Chenik video station is essentially the reverse of the installation process:

1. Pack tools needed for the Chenik removal as well as a tote for returning some items to Homer (e.g., hard drive, data logger). Most items are stored overwinter in the loft of the cabin or in the strongbox.
2. Charter Cessna 206 on floats (e.g., Northwind Aviation) to transport gear and 2 people to Chenik Lake around August 20th.
3. Haul gear and food up to the cabin for secure storage while you take down the video station.

4. Two people are needed to remove the substrate panel. Cut the zip ties to separate the net from the pipe, stash the pipe in the willows by the creek, and hang the netting over the brush to dry it out while you work on the Quad.
5. Remove the standpipe and data logger. Store the standpipe in the cabin loft and bring the data logger back to Homer.
6. Before removing your waders to work on the Quad, check the integrity of the duckbill anchors used to secure the substrate panel and make note of those that will need to be replaced next spring.
7. On the Quad, one person can remove the wind generator hub and blades while the other starts on the strongbox. A large allen wrench is needed to dis-attach the hub/blades to the wind generator. The hub/blades are stored in the loft of the cabin. Duct tape the plastic cone (stored in box) to the front of the wind generator after removing the hub/blades (protects the shaft bearings from water intrusion over winter). Note: if the wind is blowing and you're worried about getting hit by the spinning blades, flip the 3-way switch in the box to the down position to "brake" the blades (Fig 8), so you can safely grab the tail of the generator and turn it 90 deg to the wind so you can remove the blades without them turning.
8. Open the strongbox (combination lock is 8191) and disconnect the solar panel wires from the solar fuse panel on the dashboard and cover the bare ends with electrical tape (the panels are still generating electricity). Pull the solar leads out through the hole of the strongbox, neatly coil them and then disconnect the solar panel array from the brackets securing them to the Quad. With one person on the Quad deck and the other on the ground, gently lower the solar array down and lay it face down on the ground so it won't continue to generate electricity.
9. Grab the "winter" solar panel from the cabin loft and wire it into the solar fuse panel. Don't secure the panel in place yet with the bracket screwed to the deck because doing so makes it impossible to open the strongbox.
10. Turn all the switches on the fused switch panel to "OFF". Disconnect the power leads from the back of the DVR and tape the bare ends with electrical tape. Disconnect the coax/power leads from the back of the LCD monitor (by disconnecting the plug close to the monitor). Disconnect the power leads running to the video relay controller (if in use). Coil these wires up neatly and store them inside the strongbox in a loosely sealed gallon zip-lock bag.
11. Unplug the power and coax cables from the back of the two video cameras so they can be removed from their housings and stored in a box in the cabin loft for the winter.
12. Unhook the coax terminals (2 cameras and monitor) on the back of the DVR and put the DVR in the plastic tote with the cameras to be stored overwinter in the cabin loft.
13. If the Smart One was in use, power it down, disconnect the wires from the video relay controller and unscrew the unit/bracket from the Quad so it can be stored overwinter in the tote in the cabin. Remove the batteries from the unit to disable it and so they don't corrode overwinter.
14. Both toasters should remain hooked up to their respective charge controllers, which in turn should remain hooked up to the batteries to monitor their charge and divert excess input to the toasters during the winter.

15. Though it won't be operating through the winter, the wind generator stays in place and the wiring need not be disconnected. Simply push the red button on the breaker to disconnect the wind generator from the batteries.
16. Wrap up the 3' length of coax used to connect the DVR to the video relay controller and store it in an unsealed gallon zip lock in the strongbox (if sealed, condensation results).
17. To assure proper charging and load dispersion during winter, verify that all wiring connections to the batteries are secure and the wingnuts are snugged down (use crescent wrench for torque and be careful not to touch aluminum box with back end of wrench when tightening the positive terminals).
18. Re-cover the long brass bars connecting the batteries with pipe insulation foam (Fig 14).
19. Neatly organize everything being stored overwinter inside the strongbox and take a photo of the contents of the box; make note of anything that looks like it might need repair/replacement next season.
20. Use the clamp meter to verify that the lone solar panel is working and sending amperage from the solar fuse panel to the batteries (Fig 19).
21. Assuming all components are functioning properly, close up the strongbox, making sure no wires are pinched, and lock it.
22. Use plumbers putty to seal the holes where wiring enters the box (e.g., solar lead, wind generator lead, video coax; see Fig 20).
23. Finally, secure the "winter" solar panel by tucking the upper end of the horizontal frame into the bracket secured to the back of the strongbox and the bottom side of the panel into the bracket/2x6 that you then screw to the deck in a manner that "locks" the solar panel into place at a shallow angle facing south.
24. Pack up tools and gear and store most items in the cabin loft. Typically, only the water level/temperature data logger comes back to Homer.
25. Check the "flash-panel" and if it's sufficiently dry, stuff into a large trash bag and store if overwinter in the cabin. The standpipe that protects the data logger can also be stored in the cabin.
26. Carry the solar array back to the cabin and store it leaning up against the back wall or against the bunk beds.

Appendix B2.–List of tools and equipment needed to install the Chenik Lake video station, with reference to those stored on site and those that need to be brought from Homer.

Chenik 2016

Installation Date:					**:Removal Date**
Installation Start Time:					**:Removal Start Time**
Installation Complete Time:					**:Removal Complete Time**
Total Hrs:					**:Total Hrs**
Install Personnel:			**Removal Personnel:**		
	Qty	**Weight**	**Category**	**On site?**	**Comments**
IN FIELD					
brush for substrate panel	1		priority	**X**	hung under Quad deck
Pipe for WL/Temp monitor	1		priority	**X**	attic: set next to 2nd duckbill from Quad side of river
10x12 tarp (to cover panels during install)	1		priority	**X**	attic
12 V AGM batteries	5		priority	**X**	left in strong box w/ solar panel to charge
16 oz strait claw hammer	1		priority	**X**	lv in cabin
Buss bars to match/link batteries	2		priority	**X**	attached to batteries
Buss bar insulation	2		priority	**X**	Strongbox
charge control regulator, Trace C40	2		priority	**X**	Strongbox
combination padlock	1		priority	**X**	on strongbox (Combo 8191)
dustpan/sponge	1		priority	**X**	Strongbox
flashpanel	1		priority	**X**	Dried and stored in Cabin
load dispersion device (toaster)	2		priority	**X**	Strongbox
power cord for solar panels	4		priority	**X**	Lv attached to panels
remote camera cables (for 2 cameras)	~30 m		priority	**X**	on quad (stored in place overwinter)
remote camera housing & bracket	2		priority	**X**	on quad
small tool kit	1		priority	**X**	Replenish/add to as needed
solar panel array with all wiring	4		priority	**X**	Cabin
spare fuses, asst'd	1		priority	**X**	Strongbox
video "dashboard"	1		priority	**X**	Strongbox
wind generator, blades, power cable	1		priority	**X**	Blades, hub and nut in attic. Gallon jug over WG
sledgehammer	1		priority	**X**	under cabin
nose cone for WG	1		priority	**X**	Old one cracked and taped (REPLACE)?
solar panel mounting brackets	2		priority	**X**	Not in great shape should be rebuilt.
duckbill driver rod	1		priority	**X**	Bushmade should bring the real deal
steel conduit (strait edge for panel)	40'		priority	**X**	stored in willows by creek (Replace w chain?)
Grey Tote (Fragile electronics)	1		priority	**X**	in cabin with desicant
DVR	1		priority	**X**	Left on site in cabin in tote
remote camera, high res color w polarizer	1		priority	**X**	Left on site in cabin in tote
remote camera, low lux black and white	1		priority	**X**	Left on site in cabin in tote
LCD monitor w cables	1		priority	**X**	Left on site in cabin in tote
video relay	1		priority	**X**	Left on site in cabin in tote
Smartone w/ cables	1		priority	**X**	Left on site in cabin in tote

Appendix B2 (Page 2 of 2)–List of tools and equipment needed to install the Chenik Lake video station, with reference to those stored on site and those that need to be brought from Homer.

Chenik 2016

Installation Date:					**:Removal Date**
Installation Start Time:					**:Removal Start Time**
Installation Complete Time:					**:Removal Complete Time**
Total Hrs:					**:Total Hrs**
Install Personnel:			**Removal Personnel:**		
	Qty	**Weight**	**Category**	**On site?**	**Comments**
IN TOWN					
Hard drive	1	2	priority		
Allen Wrenches for WG	2	1	priority		Consider leaving on site
WL/Temp data logger	1	2	priority		(bring SS wire to hang from cap)
leatherman	1	1	priority		
Multi screw driver	1	1	priority		(might be in kit should always bring)
Adjustable wrench	1	1	priority		(might be in kit should always bring)
Electrical tape	1		priority		(might be in kit should always bring)
Side cutter	1	1	priority		(might be in kit should always bring)
Line stripper	1	1	priority		(might be in kit should always bring)
Butane torch	1	1	priority		(might be in kit should always bring)
Plumbers putty	1	1	priority		(might be in kit should always bring)
Clamp meter	1	2	priority		always bring
Battery Tester	1	2	priority		to check battery storoage campacity
Monocular	1	1	priority		Should always bring on install
Zip ties	pkg		priority		Fresh and strong
Duckbills (size 68)	3	3	priority		to replace existing if needed
Batteries for smart one	4	1	replace		4 lithium AA
cordless tools	4	30	optional		Drill, Impact, Sawzall, Circular Saw if needed
cordless tool accessories	3	20	optional		If needed
ratchet set	1	5	optional		If needed
Asst ends,connectors, shrinktube, wire	1	1	optional		If needed
Asst. screws and SS bolts	1	5	optional		If needed
SAT phone and/or DeLorme inReach	1	3	Required		
digital camera w spare batteries	1	1	personal		
VHF Radio	1	2	personal		
12 GA shotgun w slugs	1	10	Required		
bug-dope + pics for cabin	1	1	personal		
bug jackets	2	2	personal		
raingear	2	5	personal		
waders	2	10	personal		
food	nuff	10	personal		
water and/or gravity filter	2	5	personal		
white gas	1 gal	6	optional		1 spare usually in attic
Person #1	Ted	200			
Personal pack #1	Ted	20			sleeping bag, spare clothes, etc.
Person #2	Joe	200			
Personal pack #2	Joe	20			sleeping bag, spare clothes, etc.
People		400			
Gear		177			

APPENDIX C. FILE FORMAT AND ENTRY OF DATA COLLECTED AT REMOTE VIDEO STATIONS

Appendix C1.–Example of the spreadsheet used to document daily fish counts at the Mikfik and Chenik Lake remote video stations. File is located on the Homer LAN at: O:\DCF\SALMON\ESCAPEMENT\2017

Spreadsheet for recording daily salmon counts determined from remote video escapement recorders

Project: Chenik e.g., (Mikfik, Chenik, Delight, Desire, Aialik)

Year: 2015

Current Escapement: 9,750

Escapement Goal Range (Sockeye)

Project:		Low	Mid	High	
	Chenik	3,500	8,750	14,000	
	Sockeyes	544.9%	218.0%	136.2%	% of Esc. Achieved

Total Days of Operation: 36
Total Hours of Operation: 1,488.3
Total Hours of Down-time: 0.1
Reliability (% of Time Running) 100.00

Intallation Date: 12-Jun-15
Date/Time Video On: 06/15/2015 @ 13:39
Hrs to Install: 2.50
Installation Comments: cabin remodel

Take-down Date: 16-Aug-15
Date/Time Video Off: 8/16/15 @ 13:58
Hrs to take down: 2.50
Take-down Comments: cabin remodel e.g., how many people?

Note: Gray cells are auto calculated;
red bordered cells/areas with crème fill need to be filled in.

Day			Daily	Accum	Daily	Accum	% of	Sockeye					Pink				Other (specify)			
of Op	Project	Date	Weir	Weir	Video	Video	Escap.	0001-0600	0601-1200	1201-1800	1801-2400	IR Index	0001-0600	0601-1200	1201-1800	1801-2400	0001-0600	0601-1200	1201-1800	1801-2400
Input	Auto Calc	Auto Calc	User Input	Auto Calc	Auto Calc	Auto Calc	Auto Calc	User Input	User Input	User Input	User Input	nite #'s	User Input	User Input	User Input	User Input	User Input	User Input	User Input	User Input
Current Totals:			0	0	9,750	9,750	70%	875	2,267	573	6,035	0	0	0	0	0	0	0	0	0
1	Chenik	15-Jun		0	0	0	0%			0	0									
2	Chenik	16-Jun		0	99	99	1%	0	62	11	26									
3	Chenik	17-Jun		0	6	105	1%	6	0	0	0									
4	Chenik	18-Jun		0	3	108	1%	2	1	0	0									
5	Chenik	19-Jun		0	0	108	1%	0	0	0	0									
6	Chenik	20-Jun		0	0	108	1%	0	0	0	0									
7	Chenik	21-Jun		0	0	108	1%	0	0	0	0									
8	Chenik	22-Jun		0	0	108	1%	0	0	0	0									
9	Chenik	23-Jun		0	0	108	1%	0	0	0	0									
10	Chenik	24-Jun		0	0	108	1%	0	0	0	0									
11	Chenik	25-Jun		0	0	108	1%	0	0	0	0									
12	Chenik	26-Jun		0	0	108	1%	0	0	0	0									
13	Chenik	27-Jun		0	7	115	1%	0	7	0	0									
14	Chenik	28-Jun		0	0	115	1%	0	0	0	0									
15	Chenik	29-Jun		0	1	116	1%	0	1	0	0									
16	Chenik	30-Jun		0	1,264	1,380	10%	0	0	0	1,264									
17	Chenik	1-Jul		0	2,066	3,446	25%	239	228	6	1,593									
18	Chenik	2-Jul		0	778	4,224	30%	196	563	16	3									
19	Chenik	3-Jul		0	0	4,224	30%	0	0	0	0									
20	Chenik	4-Jul		0	516	4,740	34%	0	0	0	516									
21	Chenik	5-Jul		0	829	5,569	40%	185	417	225	2									
22	Chenik	6-Jul		0	0	5,569	40%	0	0	0	0									
23	Chenik	7-Jul		0	551	6,120	44%	202	273	64	12									
24	Chenik	8-Jul		0	0	6,120	44%	0	0	0	0									
25	Chenik	9-Jul		0	0	6,120	44%	0	0	0	0									
26	Chenik	10-Jul		0	0	6,120	44%	0	0	0	0									
27	Chenik	11-Jul		0	0	6,120	44%	0	0	0	0									
28	Chenik	12-Jul		0	1,830	7,950	57%	0	0	198	1,632									
29	Chenik	13-Jul		0	428	8,378	60%	17	280	1	130									
30	Chenik	14-Jul		0	0	8,378	60%	0	0	0	0									
31	Chenik	15-Jul		0	663	9,041	65%	0	2	0	661									
32	Chenik	16-Jul		0	255	9,296	66%	0	84	0	171									
33	Chenik	17-Jul		0	447	9,743	70%	28	342	52	25									
34	Chenik	18-Jul		0	7	9,750	70%	0	7	0	0									
35	Chenik	19-Jul		0	0	9,750	70%	0	0	0	0									
36	Chenik	20-Jul		0	0	9,750	70%	0	0	0	0									

Appendix C1 (Page 2 of 2).–Example of the spreadsheet used to document daily fish counts at the Mikfik and Chenik Lake remote video stations. File is located on the Homer LAN at: O:\DCF\SALMON\ESCAPEMENT\2017

Spreadsheet for recording daily salmon counts determined from remote video escapement recorders

Project: Chenik e.g., (Mikfik, Chenik, Delight, Desire, Aialik)

Year: 2015

Current Escapement: 19,073

Escapement Goal Range (Sockeye)

Project:		Low	Mid	High	
	Chenik	3,500	8,750	14,000	
	Sockeyes	544.9%	218.0%	136.2%	% of Esc. Achieved

Total Days of Operation: 63
Total Hours of Operation: 1,488.3
Total Hours of Down-time: 0.1
Reliability (% of Time Running) 100.00

Intallation Date: 12-Jun-15
Date/Time Video On: 06/15/2015 @ 13:39
Hrs to Install: 2.50
Installation Comments: cabin remodel

Take-down Date: 16-Aug-15
Date/Time Video Off: 8/16/15 @ 13:58
Hrs to take down: 2.50
Take-down Comments: cabin remodel e.g., how many people?

Note: Gray cells are auto calculated;
red bordered cells/areas with crème fill need to be filled in.

Day			Daily	Accum	Daily	Accum	% of	Sockeye					Pink				Other (specify)			
of Op	Project	Date	Weir	Weir	Video	Video	Escap.	0001-0600	0601-1200	1201-1800	1801-2400	IR Index	0001-0600	0601-1200	1201-1800	1801-2400	0001-0600	0601-1200	1201-1800	1801-2400
Input	Auto Calc	Auto Calc	User Input	Auto Calc	Auto Calc	Auto Calc	Auto Calc	User Input	User Input	User Input	User Input	nite #'s	User Input	User Input	User Input	User Input	User Input	User Input	User Input	User Input
Current Totals:			0	0	28,396	19,073	136%	1,997	7,843	4,737	13,819	0	0	0	0	0	0	0	0	0
37	Chenik	21-Jul		0	0	9,750	70%	0	0	0	0									
38	Chenik	22-Jul		0	4	9,754	70%	0	4	0	0									
39	Chenik	23-Jul		0	7	9,761	70%	0	7	0	0									
40	Chenik	24-Jul		0	0	9,761	70%	0	0	0	0									
41	Chenik	25-Jul		0	673	10,434	75%	0	0	301	372									
42	Chenik	26-Jul		0	1,715	12,149	87%	190	709	495	321									
43	Chenik	27-Jul		0	307	12,456	89%	70	207	30	0									
44	Chenik	28-Jul		0	1,695	14,151	101%	2	38	258	1,397									
45	Chenik	29-Jul		0	2,797	16,948	121%	185	1,123	243	1,246									
46	Chenik	30-Jul		0	802	17,750	127%	71	453	150	128									
47	Chenik	31-Jul		0	252	18,002	129%	14	83	23	132									
48	Chenik	1-Aug		0	166	18,168	130%	0	28	70	68									
49	Chenik	2-Aug		0	98	18,266	130%	0	32	60	6									
50	Chenik	3-Aug		0	14	18,280	131%	8	4	2	0									
51	Chenik	4-Aug		0	121	18,401	131%	10	62	35	14									
52	Chenik	5-Aug		0	320	18,721	134%	0	6	230	84									
53	Chenik	6-Aug		0	70	18,791	134%	11	0	26	33									
54	Chenik	7-Aug		0	186	18,977	136%	0	25	131	30									
55	Chenik	8-Aug		0	7	18,984	136%	0	7	0	0									
56	Chenik	9-Aug		0	0	18,984	136%	0	0	0	0									
57	Chenik	10-Aug		0	0	18,984	136%	0	0	0	0									
58	Chenik	11-Aug		0	9	18,993	136%	0	0	0	9									
59	Chenik	12-Aug		0	48	19,041	136%	0	0	28	20									
60	Chenik	13-Aug		0	19	19,060	136%	0	0	0	19									
61	Chenik	14-Aug		0	0	19,060	136%	0	0	0	0									
62	Chenik	15-Aug		0	13	19,073	136%	0	0	0	13									
63	Chenik	16-Aug		0	0	19,073	136%	0												
63		All Days	0		19,073			1,436	5,055	2,655	9,927		0	0	0	0	0	0	0	0
	Excluding lost vid:		0																	

Appendix C2.–Example of the spreadsheet used to document daily wildlife sightings and other noteworthy observations at the Mikfik and Chenik Lake remote video stations.

CHENIK LAKE REMOTE VIDEO PROJECT															12:00 AM 11:59 PM							
Day of Op	Project	Date	Daily Bear #'s	Bear (Times)	Bear Notes	Smolt (Times)	Smolt Notes	Aircraft Landing (Times)	# of People	Other (Times)	Dawn	Dusk	Water Level	Recording Notes (e.g., Video down/Back up)	Scheduled On	Scheduled Off	Hrs of Operation	Lost Video	Regained Video	Hrs Down Time
Input	Auto Calc	Auto Calc	e.g. =3+1	e.g., 2:03:41 PM	e.g., sow w 2 cubs fishing	e.g., 2:30:07 PM	e.g., lg school	e.g., 10:46, 15:27	e.g., =3+4	e.g., wolverine @15:06	e.g., 3:35:00 AM	e.g., 00:59:00 AM	e.g., Low	e.g, bad glare between 1200-1500	e.g., 00:00	e.g., 23:59	24.00	e.g., 06:00	eg., 11:30	5.5
Current Totals:			27						0								1,488.3			0.1
1	Chenik	15-Jun										0:41:00	average	video turned on 13:39	13:39	23:59	10.30			0:00
2	Chenik	16-Jun									0:04:00	0:34:00	average		0:00	0:00	24.00			0:00
3	Chenik	17-Jun									4:13:00	0:36:00	average		0:00	0:00	24.00			0:00
4	Chenik	18-Jun	1	15:21:00	walking through					otter @04:49	4:14:00	0:34:00	average		0:00	0:00	24.00			0:00
5	Chenik	19-Jun									0:04:00	0:18:00	average		0:00	0:00	24.00			0:00
6	Chenik	20-Jun									4:15:00	0:15:00	average		0:00	0:00	24.00			0:00
7	Chenik	21-Jun									4:26:00	0:30:00	average		0:00	0:00	24.00			0:00
8	Chenik	22-Jun									4:19:00	0:40:00	average		0:00	0:00	24.00	15:40	15:41	0:01
9	Chenik	23-Jun									4:07:00	0:26:00	average		0:00	0:00	24.00			0:00
10	Chenik	24-Jun									4:15:00	0:34:00	average		0:00	0:00	24.00			0:00
11	Chenik	25-Jun									4:12:00	0:30:00	average		0:00	0:00	24.00			0:00
12	Chenik	26-Jun									4:22:00	0:17:00	average		0:00	0:00	24.00			0:00
13	Chenik	27-Jun									4:40:00	0:06:00	average		0:00	0:00	24.00			0:00
14	Chenik	28-Jun									4:47:00	0:03:00	average		0:00	0:00	24.00			0:00
15	Chenik	29-Jun									4:50:00	0:11:00	average		0:00	0:00	24.00			0:00
16	Chenik	30-Jun	1	20:03:43	chasing fish on panel(nice video)					3 otters 05:38	4:44:00	0:35:00	average		0:00	0:00	24.00			0:00
17	Chenik	1-Jul									4:15:00	0:40:00	average		0:00	0:00	24.00			0:00
18	Chenik	2-Jul									4:20:00	0:30:00	average	surface turbulence	0:00	0:00	24.00			0:00
19	Chenik	3-Jul									4:20:00	0:07:00	average		0:00	0:00	24.00			0:00
20	Chenik	4-Jul									4:55:00	23:37:00	average	wet camera housing glass	0:00	0:00	24.00			0:00
21	Chenik	5-Jul									5:10:00	23:30:00	average	wet camera housing glass	0:00	0:00	24.00			0:00
22	Chenik	6-Jul									5:35:00	0:10:00	average	wet camera housing glass	0:00	0:00	24.00			0:00
23	Chenik	7-Jul									4:42:00	0:18:00	average		0:00	0:00	24.00	17:25	17:26	0:01
24	Chenik	8-Jul									4:38:00	0:18:00	average		0:00	0:00	24.00			0:00
25	Chenik	9-Jul									4:46:00	0:13:00	average		0:00	0:00	24.00			0:00
26	Chenik	10-Jul									4:36:00	0:11:00	average		0:00	0:00	24.00			0:00
27	Chenik	11-Jul									4:45:00	0:17:00	average		0:00	0:00	24.00			0:00
28	Chenik	12-Jul									4:49:00	23:42:00	average	wet camera housing glass	0:00	0:00	24.00			0:00
29	Chenik	13-Jul									5:11:00	23:57:00	average		0:00	0:00	24.00			0:00
30	Chenik	14-Jul									4:59:00	0:08:00	average		0:00	0:00	24.00			0:00
31	Chenik	15-Jul									4:46:00	23:52:00	average		0:00	0:00	24.00			0:00
32	Chenik	16-Jul									5:20:00	0:01:00	average	wet camera housing glass	0:00	0:00	24.00			0:00
33	Chenik	17-Jul									4:50:00	0:02:00	average		0:00	0:00	24.00			0:00
34	Chenik	18-Jul									5:10:00	23:59:00	average		0:00	0:00	24.00			0:00
35	Chenik	19-Jul									4:54:00	23:59:00	average		0:00	0:00	24.00			0:00
36	Chenik	20-Jul									4:59:00	0:03:00	average		0:00	0:00	24.00			0:00
37	Chenik	21-Jul									5:01:00	23:50:00	average		0:00	0:00	24.00			0:00
38	Chenik	22-Jul									5:15:00	23:33:00	average	wet camera housing glass in ever	0:00	0:00	24.00			0:00
39	Chenik	23-Jul									5:12:00	23:50:00	average		0:00	0:00	24.00			0:00
40	Chenik	24-Jul									5:05:00	23:41:00	average		0:00	0:00	24.00	14:42	14:45	0:03
41	Chenik	25-Jul									5:05:00	23:19:00	low		0:00	0:00	24.00			0:00
42	Chenik	26-Jul									5:14:00	23:33:00	low		0:00	0:00	24.00			0:00
43	Chenik	27-Jul	1	11:46:00	walking through						5:14:00	23:28:00	low	surface turbulence impaired count	0:00	0:00	24.00			0:00
44	Chenik	28-Jul									5:27:00	23:26:00	low		0:00	0:00	24.00			0:00
45	Chenik	29-Jul	1	6:53:00	looking at fish						5:14:00	23:37:00	low		0:00	0:00	24.00			0:00
46	Chenik	30-Jul	4	6:07:00	looking at fish, chasing fish, chasing fish, tears up panel						5:17:00	23:29:00	low		0:00	0:00	24.00			0:00
47	Chenik	31-Jul	1	8:40:00	removes panel from cross bar						5:15:00	23:18:00	low	substrate panel removed from stre	0:00	0:00	24.00			0:00
48	Chenik	1-Aug	2	6:37:00	walking through						5:24:00	23:14:00	low	substrate panel not effective. Surf	0:00	0:00	24.00			0:00
49	Chenik	2-Aug	1	11:28:00							5:24:00	23:20:00	low	substrate panel not effective. Sur	0:00	0:00	24.00			0:00
50	Chenik	3-Aug	2	17:44:00	walking through, pulls substrate panel out of frame						5:28:00	23:18:00	low	substrate panel not effective	0:00	0:00	24.00			0:00
51	Chenik	4-Aug	1	9:01:00	walking through						5:34:00	23:10:00	low	substrate panel not in frame	0:00	0:00	24.00			0:00
52	Chenik	5-Aug	2	13:06:00	sow with cub chasing fish						5:40:00	23:08:00	low	substrate panel not in frame	0:00	0:00	24.00			0:00
53	Chenik	6-Aug	1	16:19:00	walking through						5:49:00	23:06:00	low	substrate panel not in frame	0:00	0:00	24.00			0:00
54	Chenik	7-Aug	4	15:09:00	chasing fish, chasing another bear away on cam 2						5:35:00	23:02:00	low	substrate panel not in frame	0:00	0:00	24.00			0:00
55	Chenik	8-Aug									5:50:00	22:49:00	low	substrate panel not in frame	0:00	0:00	24.00			0:00
56	Chenik	9-Aug	1	17:56:00	investigates substrate panel pipe						5:59:00	22:59:00	low	substrate panel not in frame. Stro	0:00	0:00	24.00			0:00
57	Chenik	10-Aug	1	13:25:00	walking through						5:50:00	22:59:00	low	substrate panel not in frame. Sur	0:00	0:00	24.00			0:00
58	Chenik	11-Aug	1	13:39:00	walking through						5:55:00	22:56:00	low	substrate panel not in frame. Sur	0:00	0:00	24.00			0:00
59	Chenik	12-Aug									6:03:00	22:53:00	low	substrate panel not in frame.	0:00	0:00	24.00			0:00
60	Chenik	13-Aug									5:55:00	22:45:00	low	substrate panel not in frame.	0:00	0:00	24.00			0:00
61	Chenik	14-Aug	1	20:18:00	walking through						6:06:00	22:27:00	low	substrate panel not in frame.	0:00	0:00	24.00			0:00
62	Chenik	15-Aug	1	10:04:00	walking through						6:25:00	22:32:00	low	substrate panel not in frame.	0:00	0:00	24.00			0:00
63	Chenik	16-Aug												END OF SEASON	0:00	13:58	14.00	1:58		0:00

Appendix C3.–Example of the spreadsheet used to document video quality and review time statistics for the Mikfik and Chenik Lake remote video stations.

CHENIK LAKE REMOTE VIDEO PROJECT

Day of Op	Project	Date	DVR Used in Field	Hard Drive Unit #	Record (IPS)	Recording Quality	File Format	Replay FPS	Reviewer	Weather (Wind, Precip, Sky)	Video Quality	Review time Start	Review time Stop	Approx. Review Hrs	Review Minutes	Review Comments
Input	Auto Calc	Auto Calc	Model/Unit #	e.g., 0801	e.g, 5	e.g., Low	M-JPEG	e.g., 20	your name	e.g., E20, rain, OVCST	e.g., A+	8:00:00	16:30:00	3:00	180	e.g., steady stream of fish today
Current Totals:														11:08	2108	
1	Chenik	15-Jun	09-04	250-01	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	12:55:00	13:08:00	0:13	13	
2	Chenik	16-Jun	09-04	250-01	5	Low	M-JPEG	6x-5ips	J.Loboy	mostly sunny	a	13:10:00	13:36:00	0:26	26	
3	Chenik	17-Jun	09-04	250-01	5	Low	M-JPEG	6x-5ips	J.Loboy	mostly sunny	a	13:37:00	13:56:00	0:19	19	
4	Chenik	18-Jun	09-04	250-01	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	14:00:00	14:16:00	0:16	16	
5	Chenik	19-Jun	09-04	250-01	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	14:17:00	14:32:00	0:15	15	
6	Chenik	20-Jun	09-04	250-01	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	14:32:00	14:44:00	0:12	12	
7	Chenik	21-Jun	09-04	250-01	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	14:44:00	14:56:00	0:12	12	
8	Chenik	22-Jun	09-04	250-01	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	8:10:00	15:04:00	0:21	21	
9	Chenik	23-Jun	09-04	250-06	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	8:24:00	8:37:00	0:13	13	
10	Chenik	24-Jun	09-04	250-06	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	8:38:00	8:50:00	0:12	12	
11	Chenik	25-Jun	09-04	250-06	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	9:25:00	9:37:00	0:12	12	
12	Chenik	26-Jun	09-04	250-06	5	Low	M-JPEG	8x	J.Loboy	rain	a	9:37:00	9:49:00	0:12	12	
13	Chenik	27-Jun	09-04	250-06	5	Low	M-JPEG	8x	J.Loboy	rain	a	9:50:00	10:04:00	0:14	14	
14	Chenik	28-Jun	09-04	250-06	5	Low	M-JPEG	8x	J.Loboy	rain	a	10:04:00	10:23:00	0:19	19	
15	Chenik	29-Jun	09-04	250-06	5	Low	M-JPEG	8x	J.Loboy	rain	a	10:23:00	10:36:00	0:13	13	
16	Chenik	30-Jun	09-04	250-06	5	Low	M-JPEG	15-60ips	J.Loboy	mostly sunny	a	10:36:00	11:45:00	1:09	69	fish passage through dusk
17	Chenik	1-Jul	09-04	250-06	5	Low	M-JPEG	15-60ips	J.Loboy	mostly sunny	a	1:45:00	12:15:00	1:39	99	fish passage before/after dawn/dusk
18	Chenik	2-Jul	09-04	250-06	5	Low	M-JPEG	60ips-6x	J.Loboy	windy	a-	3:00:00	4:00:00	1:00	60	no fish from dawn to ~0800
19	Chenik	3-Jul	09-04	250-06	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	4:00:00	4:14:00	0:14	14	
20	Chenik	4-Jul	09-04	250-06	5	Low	M-JPEG	60ips-6x	J.Loboy	rainy wet rain	c-	4:14:00	4:54:00	0:40	40	cam housing glass wet/ blurred image
21	Chenik	5-Jul	09-04	250-06	5	Low	M-JPEG	60ips-6x	J.Loboy	rainy wet rain	c-	8:00:00	9:09:00	1:09	69	Fish passage July 4-5 dark period.
22	Chenik	6-Jul	09-04	250-06	5	Low	M-JPEG	6x	J.Loboy	rain	b	9:15:00	9:34:00	0:19	19	no fish
23	Chenik	7-Jul	09-04	250-06	5	Low	M-JPEG	60ips-6x	J.Loboy	mostly sunny	a	8:54:00	10:23:00	0:58	58	fish passage before dawn
24	Chenik	8-Jul	09-04	250-09	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	9:03:00	9:15:00	0:12	12	
25	Chenik	9-Jul	09-04	250-09	5	Low	M-JPEG	8x	J.Loboy	rain	a	9:15:00	9:26:00	0:11	11	
26	Chenik	10-Jul	09-04	250-09	5	Low	M-JPEG	16x	J.Loboy	mostly sunny	a	9:26:00	9:32:00	0:06	6	
27	Chenik	11-Jul	09-04	250-09	5	Low	M-JPEG	16x	J.Loboy	mostly sunny	a	9:32:00	9:42:00	0:10	10	
28	Chenik	12-Jul	09-04	250-09	5	Low	M-JPEG	15-60ips	J.Loboy	rain	b	9:49:00	10:43:00	0:54	54	cam housing glass wet/ blurred image
29	Chenik	13-Jul	09-04	250-09	5	Low	M-JPEG	15-60ips	J.Loboy	mostly sunny	a	10:43:00	11:50:00	1:07	67	
30	Chenik	14-Jul	09-04	250-09	5	Low	M-JPEG	16x	J.Loboy	mostly sunny	a	13:23:00	13:33:00	0:10	10	
31	Chenik	15-Jul	09-04	250-09	5	Low	M-JPEG	15-60ips	J.Loboy	evening rain	a	13:35:00	14:07:00	0:32	32	fish passage through dusk.
32	Chenik	16-Jul	09-04	250-09	5	Low	M-JPEG	15-60ips	J.Loboy	storm	c-	14:07:00	14:53:00	0:46	46	fish passage through dusk.
33	Chenik	17-Jul	09-04	250-09	5	Low	M-JPEG	60ips-6x	J.Loboy	mostly sunny	a	15:15:00	15:58:00	0:43	43	
34	Chenik	18-Jul	09-04	250-09	5	Low	M-JPEG	6x	J.Loboy	mostly sunny	a	15:59:00	16:17:00	0:18	18	
35	Chenik	19-Jul	09-04	250-09	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	16:17:00	16:30:00	0:13	13	

Appendix C3 (Page 2 of 2).–Example of the spreadsheet used to document video quality and review time statistics for the Mikfik and Chenik Lake remote video stations.

CHENIK LAKE REMOTE VIDEO PROJECT

Day of Op	Project	Date	DVR Used in Field	Hard Drive Unit #	Record (IPS)	Recording Quality	File Format	Replay FPS	Reviewer	Weather (Wind, Precip, Sky)	Video Quality	Review time Start	Review time Stop	Approx. Review Hrs	Review Minutes	Review Comments
Input	Auto Calc	Auto Calc	Model/Unit #	e.g., 0801	e.g, 5	e.g., Low	M-JPEG	e.g., 20	your name	e.g., E20, rain, OVCST	e.g., A+	8:00:00	16:30:00	3:00	180	e.g., steady stream of fish today
Current Totals:														11:08	2108	
36	Chenik	20-Jul	09-04	250-09	5	Low	M-JPEG	8x	J.Loboy	windy	a	16:30:00	16:39:00	0:09	9	
37	Chenik	21-Jul	09-04	250-09	5	Low	M-JPEG	8x	J.Loboy	mostly sunny	a	16:39:00	16:54:00	0:15	15	
38	Chenik	22-Jul	09-04	250-09	5	Low	M-JPEG	6x	J.Loboy	rain	a-	11:15:00	11:32:00	0:17	17	
39	Chenik	23-Jul	09-04	250-09	5	Low	M-JPEG	6x	J.Loboy	windy	a	11:32:00	11:47:00	0:15	15	
40	Chenik	24-Jul	09-04	250-09	5	Low	M-JPEG	6x	J.Loboy	mostly sunny	a	7:30:00	11:56:00	0:16	16	coax or power problems on camera 1
41	Chenik	25-Jul	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	rain	a	7:37:00	10:06:00	0:52	52	
42	Chenik	26-Jul	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	rain	a	10:06:00	11:53:00	1:47	107	fish passage at dawn and dusk
43	Chenik	27-Jul	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	12:19:00	13:09:00	0:50	50	fish passage at dawn
44	Chenik	28-Jul	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	13:19:00	14:38:00	1:19	79	fish passage at dusk
45	Chenik	29-Jul	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	7:40:00	11:09:00	2:14	134	fish passage before dawn
46	Chenik	30-Jul	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	11:15:00	14:26:00	1:21	81	fish passage at dawn
47	Chenik	31-Jul	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	14:40:00	15:37:00	0:57	57	fish passage at dawn.
48	Chenik	1-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	15:40:00	16:26:00	0:46	46	Substrate panel moved, count may suffer.
49	Chenik	2-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	windy	a	8:00:00	8:34:00	0:34	34	Substrate panel moved, count may suffer.
50	Chenik	3-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	8:34:00	9:12:00	0:38	38	Substrate panel moved, count may suffer.
51	Chenik	4-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	rain	a	9:12:00	10:00:00	0:48	48	Substrate panel moved, count may suffer.
52	Chenik	5-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	10:30:00	11:33:00	1:03	63	Substrate panel moved, count may suffer.
53	Chenik	6-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	14:15:00	14:41:00	0:26	26	Substrate panel moved, count may suffer.
54	Chenik	7-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	15:45:00	16:24:00	0:39	39	Substrate panel moved, count may suffer.
55	Chenik	8-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	rain	a	7:50:00	9:18:00	0:43	43	Substrate panel moved, count may suffer.
56	Chenik	9-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	rain	a	9:18:00	9:43:00	0:25	25	Substrate panel moved, count may suffer.
57	Chenik	10-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	windy	a	9:45:00	10:17:00	0:32	32	Substrate panel moved, count may suffer.
58	Chenik	11-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	windy	a	10:18:00	10:39:00	0:21	21	Substrate panel moved, count may suffer.
59	Chenik	12-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	10:40:00	11:04:00	0:24	24	Substrate panel moved, count may suffer.
60	Chenik	13-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	mostly sunny	a	11:04:00	11:27:00	0:23	23	Substrate panel moved, count may suffer.
61	Chenik	14-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	ovcst	a	11:27:00	11:54:00	0:16	16	Substrate panel moved, count may suffer.
62	Chenik	15-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	rain then ovcst	a	11:54:00	12:13:00	0:19	19	Substrate panel moved, count may suffer.
63	Chenik	16-Aug	09-04	320-83	5	Low	M-JPEG	2x-60ips	J.Loboy	xxxx	xxx	0:00:00	0:00:00	0:00	0	END OF SEASON
														11:08	2,108	minutes
															35.1	hrs to review this year's escapement

APPENDIX D. PHOTOGRAPHS ILLUSTRATING MIKFIK AND CHENIK LAKE VIDEO INSTALLATION, OPERATION, AND REMOVAL STEPS REFERENCED IN APPENDICES A AND B

Appendix D1.–Photographs referenced in Appendices A and B.

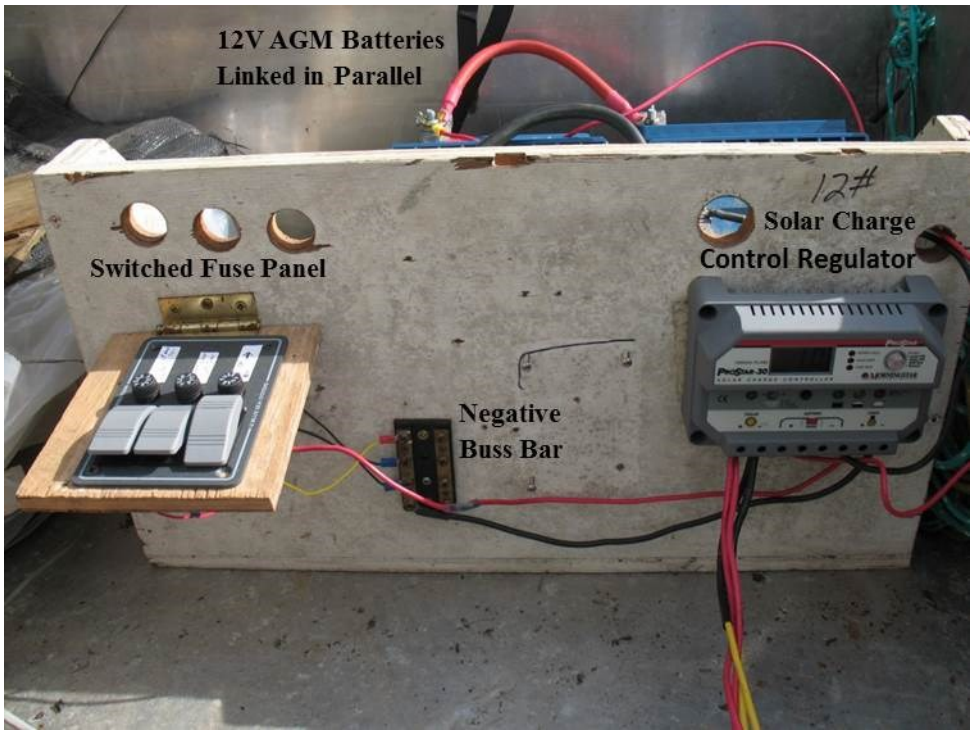


Figure 2. Video dashboard inside the strongbox at Mikfik Creek, showing batteries on one side and the solar charge controller, switched fuse panel, and negative buss bar on the other side.

Figure 3. Accessing the Pelican case at the top of the light pole at Mikfik Creek using the collapsible ladder stored inside the creek-side strongbox.

A. 

B. 

Figure 4A: Pelican case affixed to the top of the light pole at Mikfik Creek that houses the video transceiver and antenna. 4B: Note the power cable and video coax that terminate inside the case.

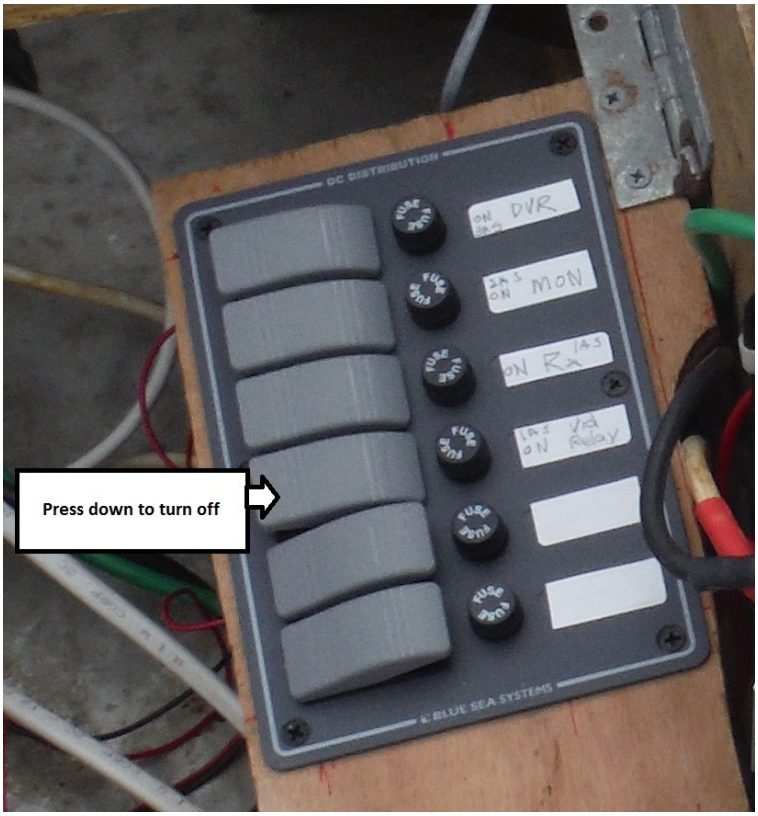


Figure 5. Close up of standard switched fuse panel used to protect electrical accessories and turn them on and off for installation and maintenance.

Figure 6. Use square tube pipe (stored inside box) to pivot the light pole after loosening the two bolts that secure it in place. Wrenches for loosening these bolts are stored in the box. Be sure to re-secure the pole in the new position so it won't pivot while servicing the camera.

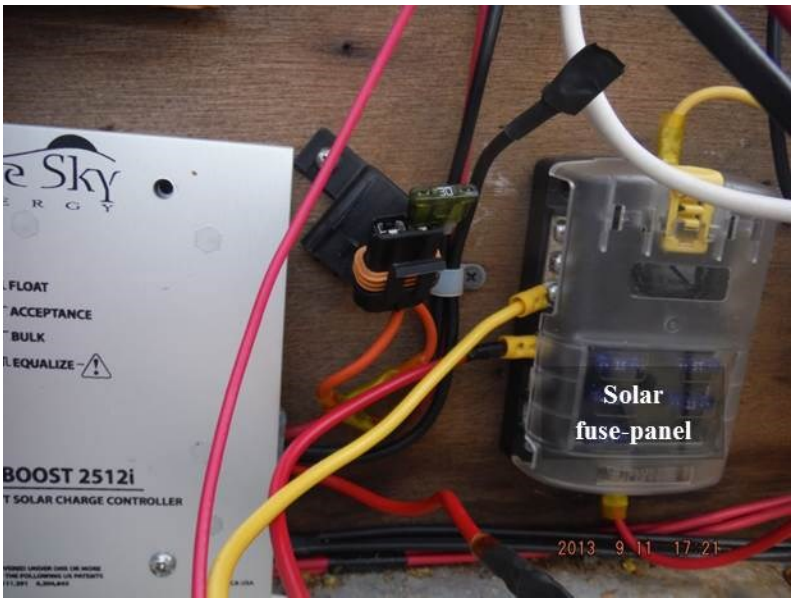


Figure 7. Photo of the solar fuse panel where positive and negative leads from the solar panels terminate.

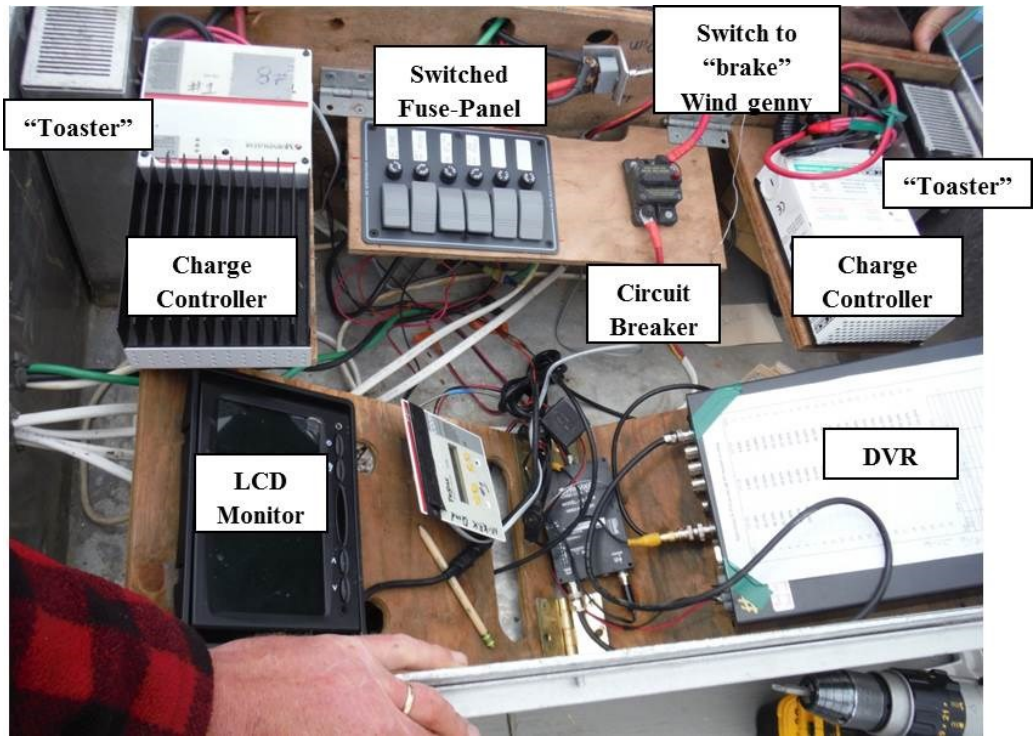


Figure 8. View inside the strong box at Mikfik Lake. Note the circuit breaker and 3-way switch used to "brake" the wind generator. Note also the two charge controllers and "toasters".

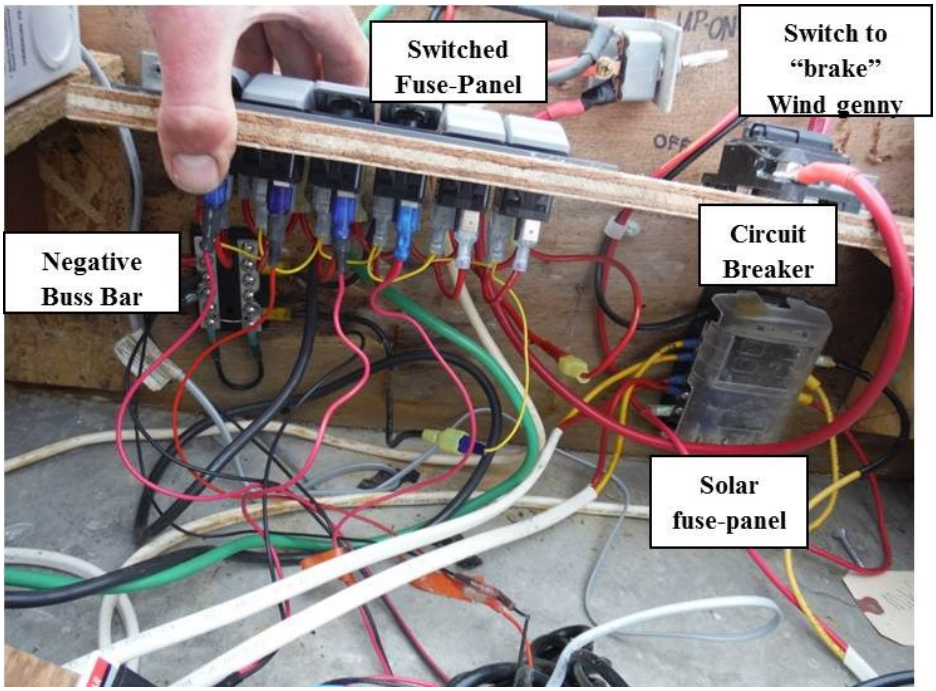


Figure 9. Photo illustrating positive leads from electronic components terminating at the switched fuse panel. Negative leads from electronic components terminate at the negative buss bar.

Figure 10. Microwave antenna affixed to the solar panel bracket and pointed directly at the transceiver attached to the light pole at Mikfik Creek. Note the large coax that runs into the strong box.

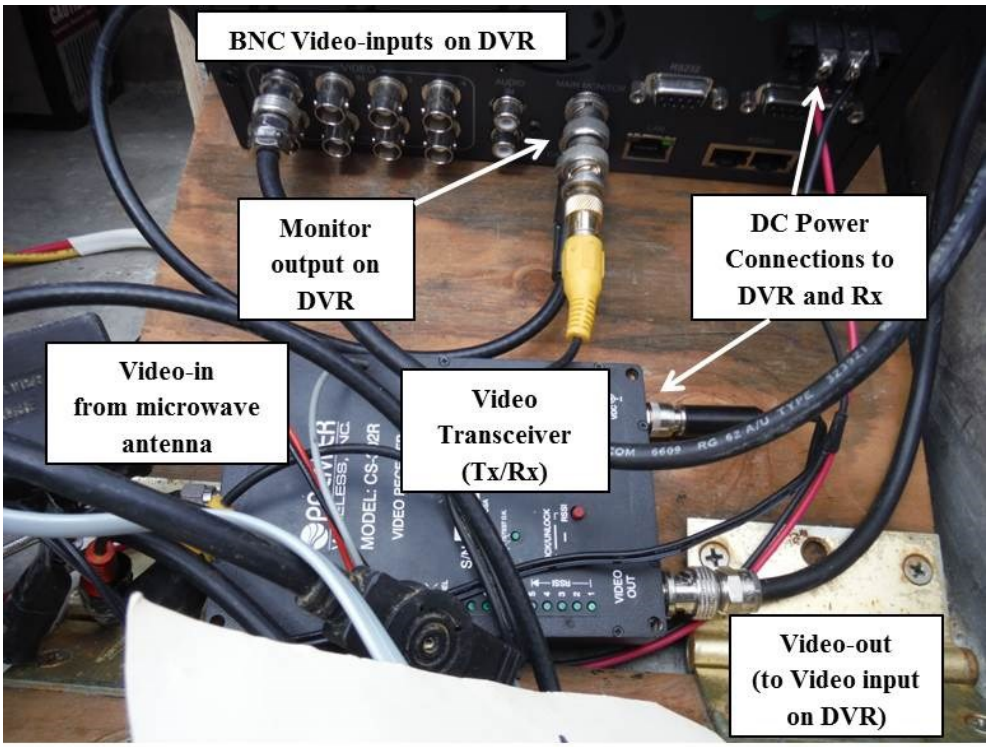


Figure 11. The video transceiver has BNC terminals for Video In (top) and Video Out (bottom), as well as an input for DC power. Note also the BNC terminals on back of the DVR for video inputs and monitor output.

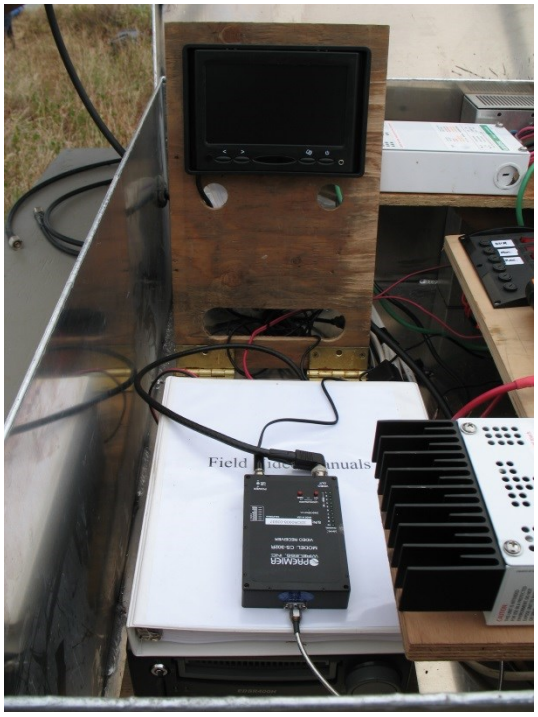


Figure 12. Alternate view of the video transceiver (set up here as a receiver (Rx) capturing video from the Mikfik transmitter (Tx) via a microwave antenna. Note the video input (bottom) from the antenna, the video output to the DVR (top right) and the power input to the Rx (top left).

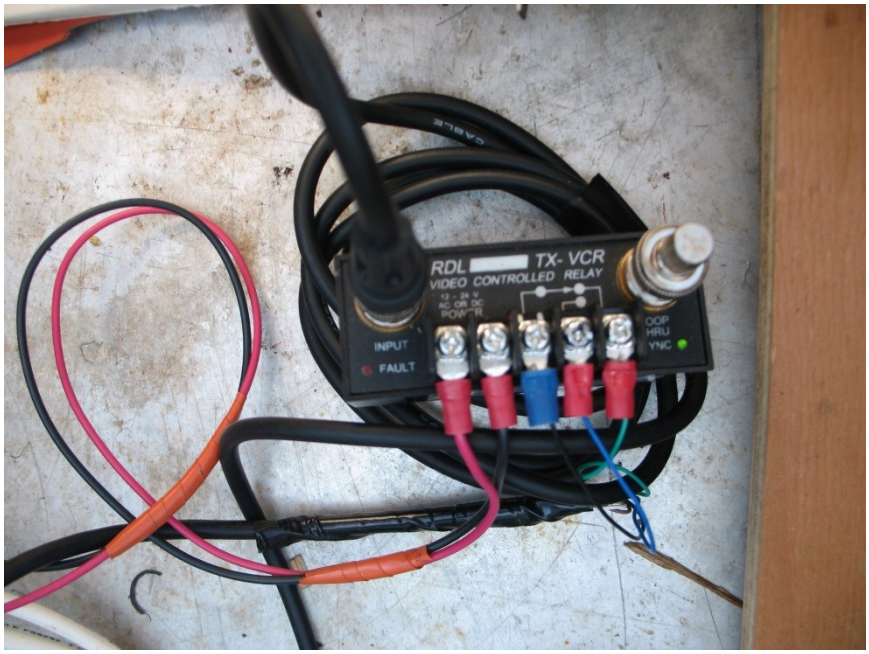


Figure 13. Video controller relay required when using the "Smart One" satellite messenger to email alerts when video is lost. Coax from the call monitor on DVR connects to the input BNC jack (on left). Wired connections on the relay, from L-R: red (+) from fused switch panel, black (-) to negative buss, then black, blue, green from Smart One. A 75 Ohm BNC "plug" must be attached to "loop thru SYNC" terminal (on the right) for unit to work effectively.

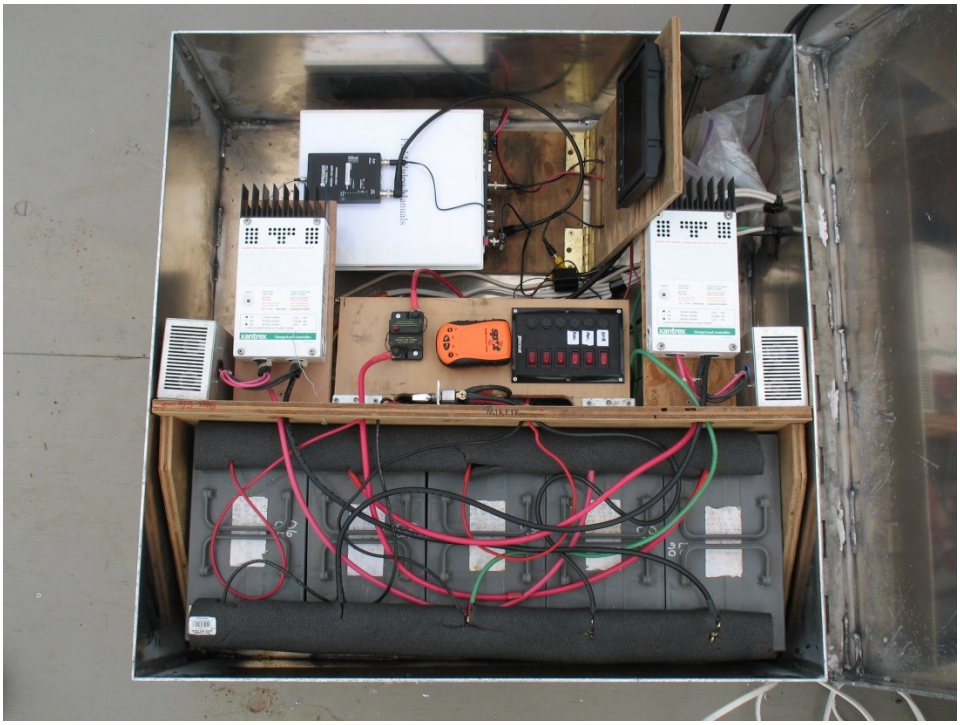


Figure 14. Overview of electronic components inside the strongbox. Note pipe insulation covering bronze buss bars connecting all five 12V AGM batteries and the way (+) and (-) leads from major power inputs (e.g., wind generator and solar panels) and outputs (e.g., charge controllers/toasters) are connected to terminals on opposite ends of the battery bank.

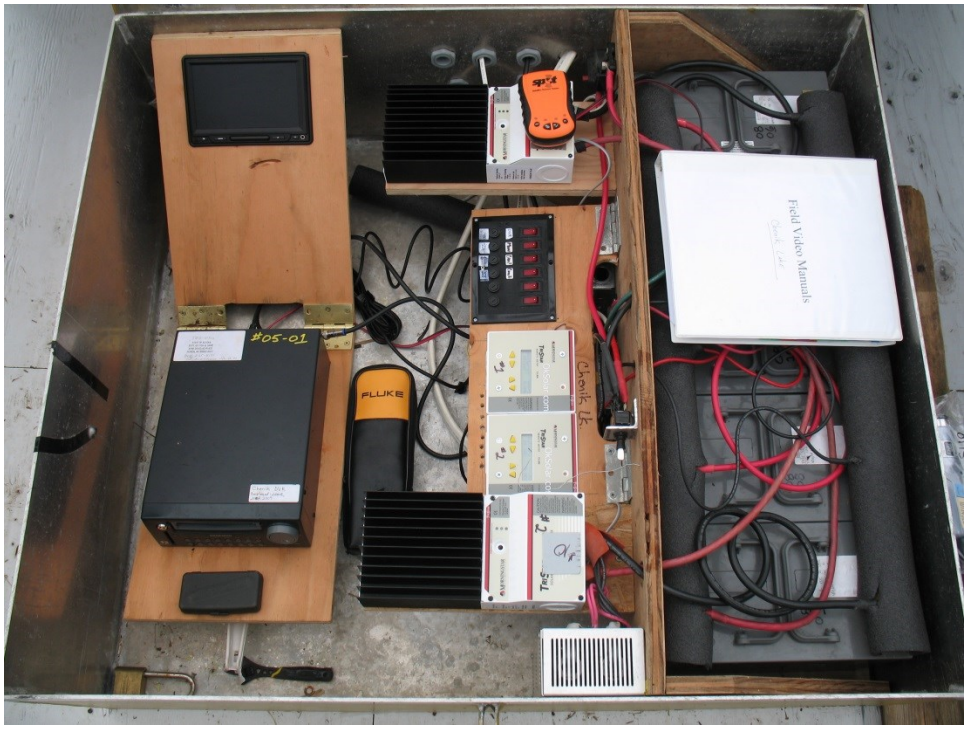


Figure 15. Layout inside strongbox allowing access to DVR controls while viewing monitor.

A. 

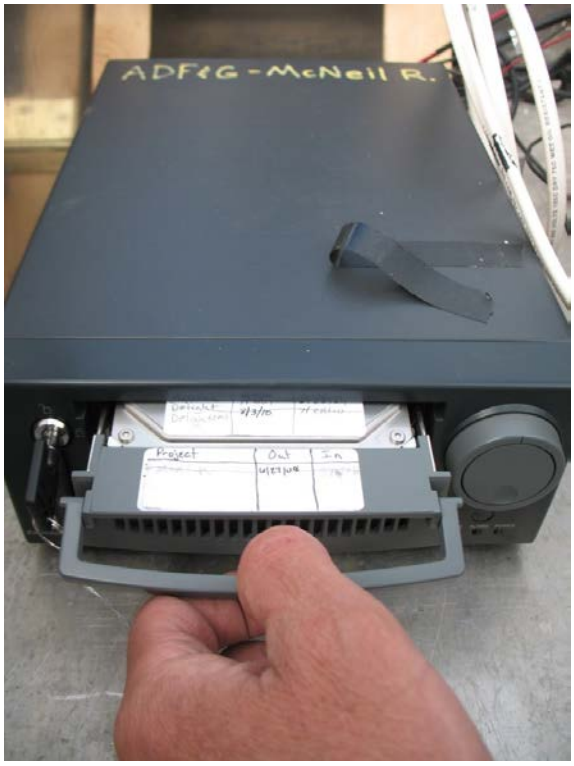
B. 

Figure 16. Photos illustrating use of key to unlock (A) and remove (B) hard drive for swapping.

Figure 17. Close up view of video monitor illustrating the camera's view. Note the location of the power button, the time/date stamp, and key recording stats such as hard disk size, operation mode, recording position, and recording speed.

Figure 18. DVR control panel illustrating key buttons and indicator lights.

Figure 19. Use a clamp meter to check amperage gains (from solar panels and wind generator) and draws (from various electronic components) to make sure they're in the expected ranges. Note: clamp meter goes around just the positive lead.

Figure 20. Use plumbers putty to waterproof the holes in the strongbox through which coax and electrical wires are routed.

Figure 21. View of Mikfik strongbox with items stored inside for winter. Note that the two camera site batteries are stored in the creek-side strongbox now that we have a solar panel there.

Figure 22. Illustrates the location of the substrate panel at the outlet of Chenik Lake, relative to the position of the Chenik Quad positioned on the south bank.

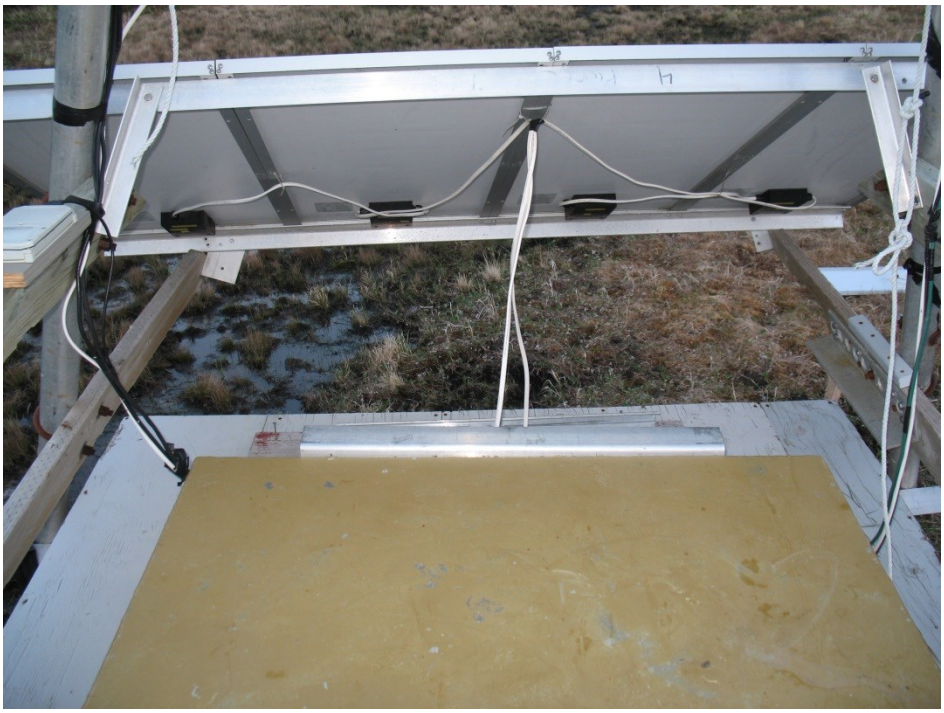


Figure 23. Illustrates the aluminum brackets used to attach the solar panel array to the Quad at Chenik Lake.