

# *River Watch*



**Part 1 – Introduction and background**

**Part 2 - Aerial photographs illustrating various ice conditions**

**Part 3 - River PIREP format and terminology**

**Part 4 - Tips on taking aerial photographs of river ice**

<http://aprfc.arh.noaa.gov/rivwatch.php>





# ***RIVER WATCH PROGRAM***

- Purpose of program is to assist the NWS in providing accurate forecasts, warnings, and river navigation information
- A voluntary program asking pilots and other individuals to report observed river conditions
- Requesting observations that can be obtained without deviation from the normal route or flight level
- Standard method of reporting is to submit pilot report to FAA's Flight Service Stations by radio
- Other reporting options are phone, emailing report and/or digital photos, and filling out a web form

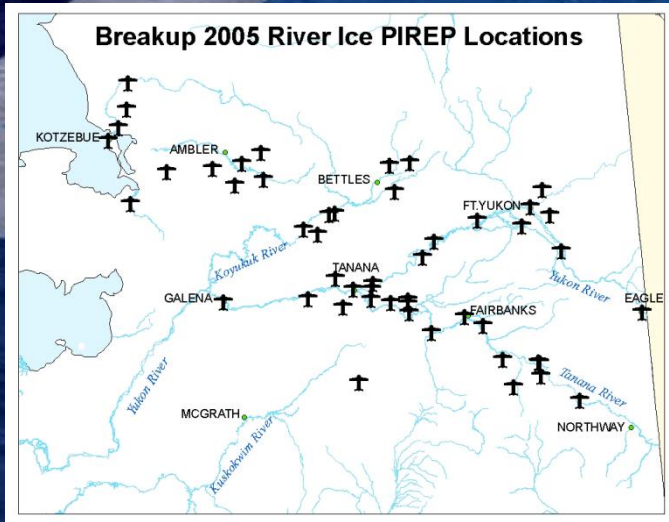


## BACKGROUND

- National Weather Service (NWS) monitors ice breakup conditions throughout Alaska to assess flood threats and navigational hazards
- Other monitoring capabilities leave large voids in the knowledge of river and lake ice conditions...
  - ✓ A monitoring program conducted in conjunction with Alaska Division of Homeland Security and Emergency Management in chartered aircraft is only done in specific locations when flood threat is high
  - ✓ Observers in villages along rivers provide a ground based view only in front of their village
  - ✓ Satellite images provide some broad information on larger rivers, but lack the resolution to fully understand the ice conditions
- Supplemental aerial observations from aircraft flying at lower altitudes have significantly enhanced the spatial and temporal coverage of information on ice characteristics

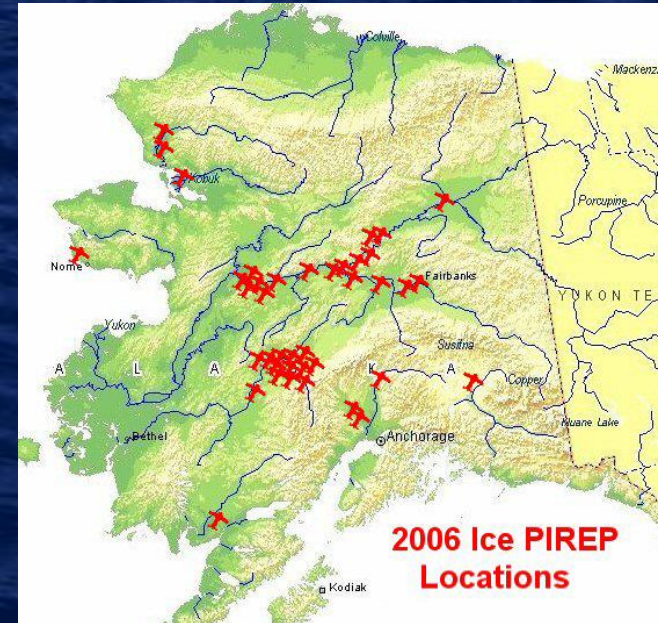
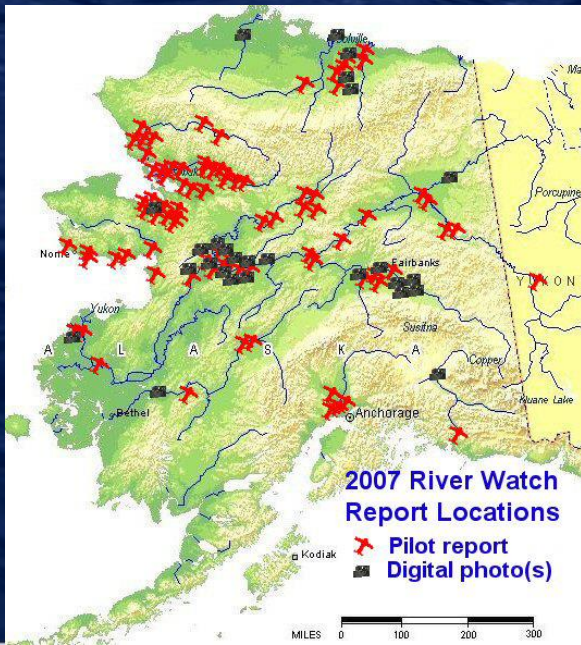


# 2005-7 RIVER WATCH PROGRAM



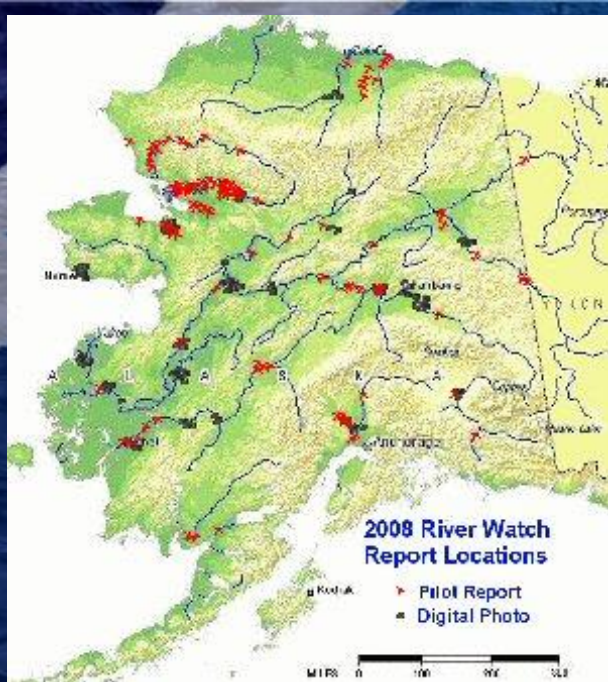
*The first year of the program targeted Fairbanks FSS, air taxi operators, and private pilots*

*The 2006 program expanded into southwest and southcentral Alaska*

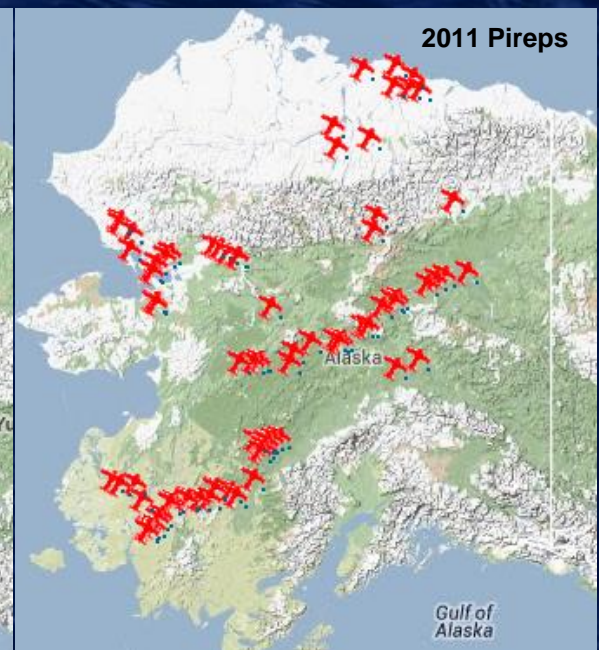
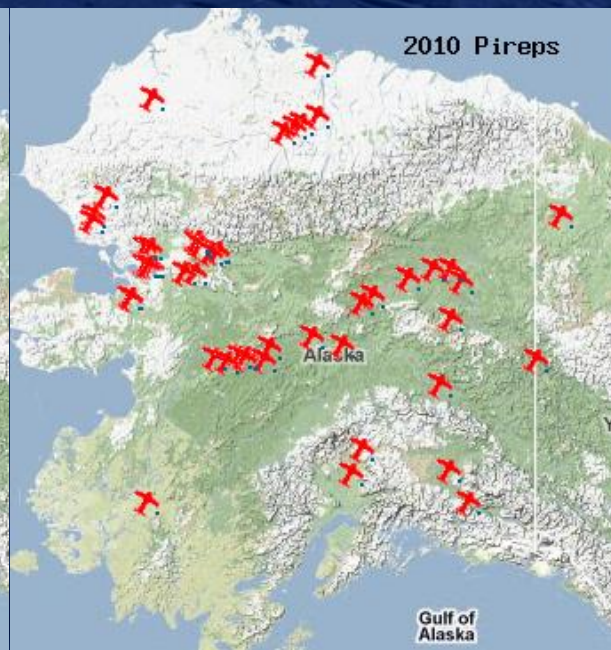
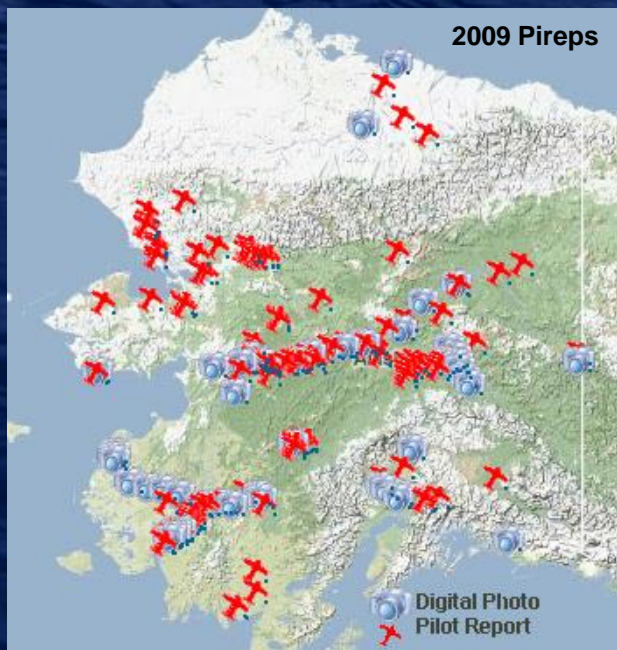
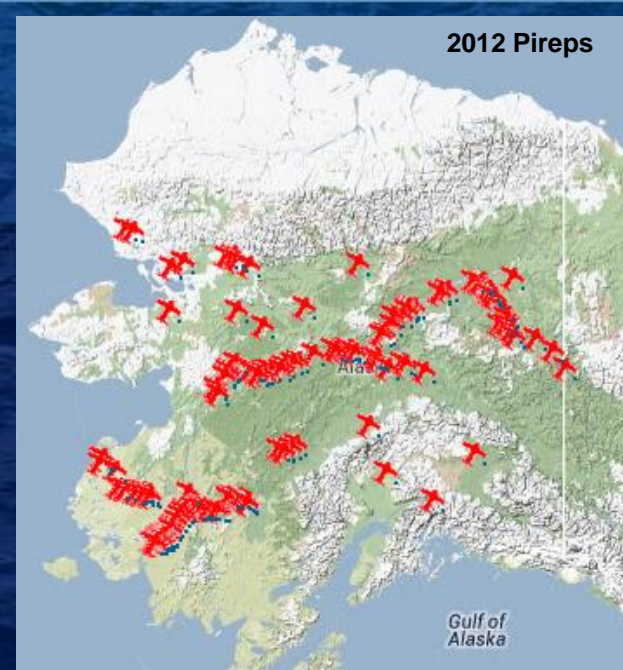


*The 2007 program continued to expand its coverage statewide*





*Spring 2009 breakup along the Yukon and Kuskokwim River resulted in the most destructive flooding in many decades. Communities made preparations to deal with high water and major flooding based on NWS Warnings which were issued in part due to observational information gathered from PIREPs during River Watch flights.*



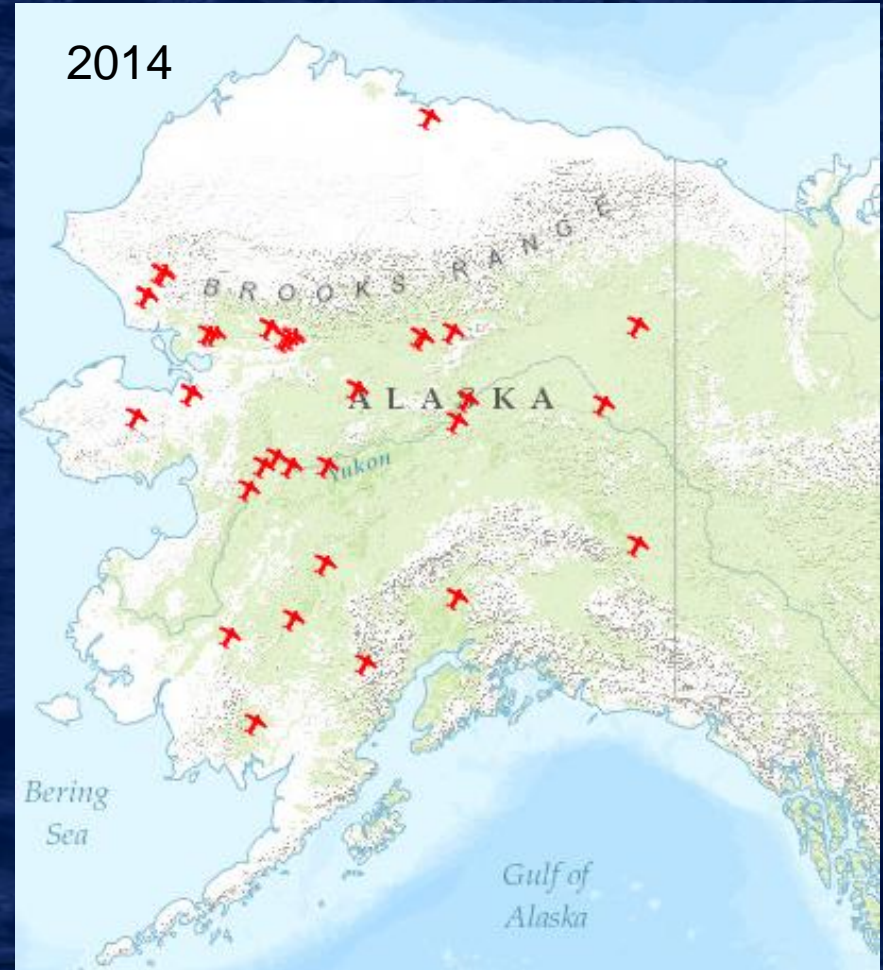


# 2013 and 2014 saw a slight decline in PIREPs

2013



2014





# FEEDBACK - COMPILATION OF OBSERVATIONS

Follow progress of breakup on Alaska Weather on PBS or on web  
<http://aprfc.arh.noaa.gov/>

May 28, 2013  
6:30 pm

*The progress of breakup is displayed on the web graphically along with text reports and selected recent photos. Pilot reports are used to provide more accurate information on this map.*

Village Legend	
●	No Warnings ●
●	Flood Watch ●
●	Flood Warning ●

River Legend	
■	Unknown
■	Mostly Ice
■	Some Open
■	Mostly Open
■	Open
■	Flood Watch
■	Flood Warning

<http://aprfc.arh.noaa.gov>

*Observations of ice conditions on these or any Alaska rivers and lakes are needed*

# FEEDBACK - SEARCH REPORTS ON WEB

<http://aprfc.arh.noaa.gov/php/rivnotes/searchnotes.php>

Anyone can search our river notes database for pilot or other reports of river ice conditions by river, location, or view all reports or only PIREPs

## River Notes Database Search

**These are unofficial remarks which may not have been quality controlled.**

Search by using one of the choices below

Select by River:	Select a River <input type="button" value="v"/>	<input type="button" value="submit"/> 2013 <input type="button" value="v"/>	<input checked="" type="radio"/> Date <input type="radio"/> Location
Select by Location:	Select Location <input type="button" value="v"/>	<input type="button" value="submit"/> 2013 <input type="button" value="v"/>	<input checked="" type="radio"/> Date <input type="radio"/> River
Select All and order by :	Select Value <input type="button" value="v"/>	<input type="button" value="submit"/> 2013 <input type="button" value="v"/>	
Select All PIREPS and order by :	Select Value <input type="button" value="v"/>	<input type="button" value="submit"/> 2013 <input type="button" value="v"/>	
Search database remarks by a single text word :	Enter Text Here <input type="text"/>	<input type="button" value="submit"/> 2013 <input type="button" value="v"/>	

Pireps with RIV in remarks are below and are updated each hour - Pireps in database above are entered between 6am and 5pm

Last ran at Thu Mar 30 19:08:01 UTC 2013

Pireps on 03 30 13

UAAK04 KAWN 301700SMU UA /OV GAL 045010/TM 1736/FL045/TP C182/SK CAVU/TB NEG/RM YUKON RIV HARD ARCHED ICE =

Pireps on 03 29 06

Pireps on 03 28 06

Pireps on 03 27 06



# TRAINING RESOURCES

Program web site...

<http://aprfc.arh.noaa.gov/rivwatch.php>

## Submit an ice condition report

- [Fill out web form](#)
- [Submit an email ice report or digital photo](#)

Additional information about the program and tools to download are available at the following links:

Program background:

- [Frequently Asked Questions about River Watch Program](#)
- [View River Watch Program Presentation](#)

Training materials:

- [Download River Watch Program Presentation](#)
- [Download River Watch Program Overview Presentation](#)
- [Text Description of River Breakup](#)
- [Maps with River Miles](#)
- [Download River Ice Remarks Checklist...MS Word](#)
- [Download River Ice Remarks Checklist...Adobe pdf](#)
- [Download Pilot Report Format and River Ice Remarks Checklist...Adobe pdf](#)
- [Download Guide to River Ice in normal page sequence format...Adobe pdf](#)
- [Download Guide to River Ice in two-sided booklet printing format...Adobe pdf](#)

Results:

- [View Breakup Map](#)
- [Search Observations](#)
- [View Watches and Warnings](#)
- [View Breakup Text Summary](#)

Email us about this program:

- [Submit a comment or question about the program](#)

**National Weather Service**  
**Alaska - Pacific**  
**River Forecast Center**

HOME NWS Site Map National News Organization

Local Forecasts by City, State, Zip  
City: State: Go

**Rivers & Hydrology**  
River conditions  
Forecasts & Info  
Quick Briefing  
48hr Flood Pot  
5-Day Flood  
Outlook  
Nat'l AHP's page

**Precip & Weather**  
Observed Precip  
Forecast Precip  
AK Snow Maps  
Nat'l Snow Info  
Wx Forecasts  
Observations  
Radar  
Satellite

**Breakup & Ice**  
Quick Briefing  
Flood Potential  
Breakup Map  
Ice Maps  
Freezing DD  
More...

**Climate & History**  
Drought Info  
Predictions  
Disasters

National Weather Service (NWS) is responsible for monitoring ice breakup conditions throughout Alaska to assess flood threats and navigational hazards. Ground observations, aerial reconnaissance, and remote sensing are sources used to assess ice conditions. Although ice jam flooding is most common during the ice breakup season, ice condition reports are welcome during freezeup and mid-winter as well.

We have relied for many years on observations of Alaska village residents describing the river ice condition in front of the village. Supplemental aerial observations from aircraft flying at low to mid-level altitudes have significantly enhanced the information on ice conditions. Since ice conditions can vary significantly along a river and can change rapidly during the breakup process, numerous observations are needed statewide to assess the status of breakup. It must be stressed that we are looking for reliable and objective reports.

The River Watch Program is a voluntary program that is...

- Asking pilots and village residents to provide reports of river ice conditions
- Requesting pilot observations that can be obtained without deviation from the normal route or flight level
- Stressing that river ice observations only be taken when it can be done safely
- Serving the purpose to assist the NWS in providing accurate forecasts, warnings, and navigation information

River and lake ice observations can be provided to the Alaska-Pacific River Forecast Center (APRFC) via:

- radio from aircraft to AFSS with observations for inclusion in a PIREP
- phone at 1-800-847-1739
- email report and/or photos using link on this page
- fill out web form using link on this page

**Submit an ice condition report**

- [Fill out web form](#)
- [Submit an email ice report or digital photo](#)

## River Watch

### STANDARD REMARKS (PRE-BREAKUP)

- UNBKN ICE
- ARCHED ICE
- LIFTED ICE
- SHIFTED ICE
- OPEN REACH

Feel free to request group training from your NWS contact



The logo for River Watch, featuring the text "River Watch" in orange above a photograph of a river with a small boat.

River Watch

# CONTACT INFORMATION

River Forecast Center (ANC) – Scott Lindsey  
[scott.lindsey@noaa.gov](mailto:scott.lindsey@noaa.gov) 907-266-5152

Service Hydrologist (FAI) – Ed Plumb  
[edward.plumb@noaa.gov](mailto:edward.plumb@noaa.gov) 907-458-3714

Aviation Focal Point (ANC) – Becky Perry  
[becky.perry@noaa.gov](mailto:becky.perry@noaa.gov) 907-266-5162

<http://aprfc.arh.noaa.gov/rivwatch.php>





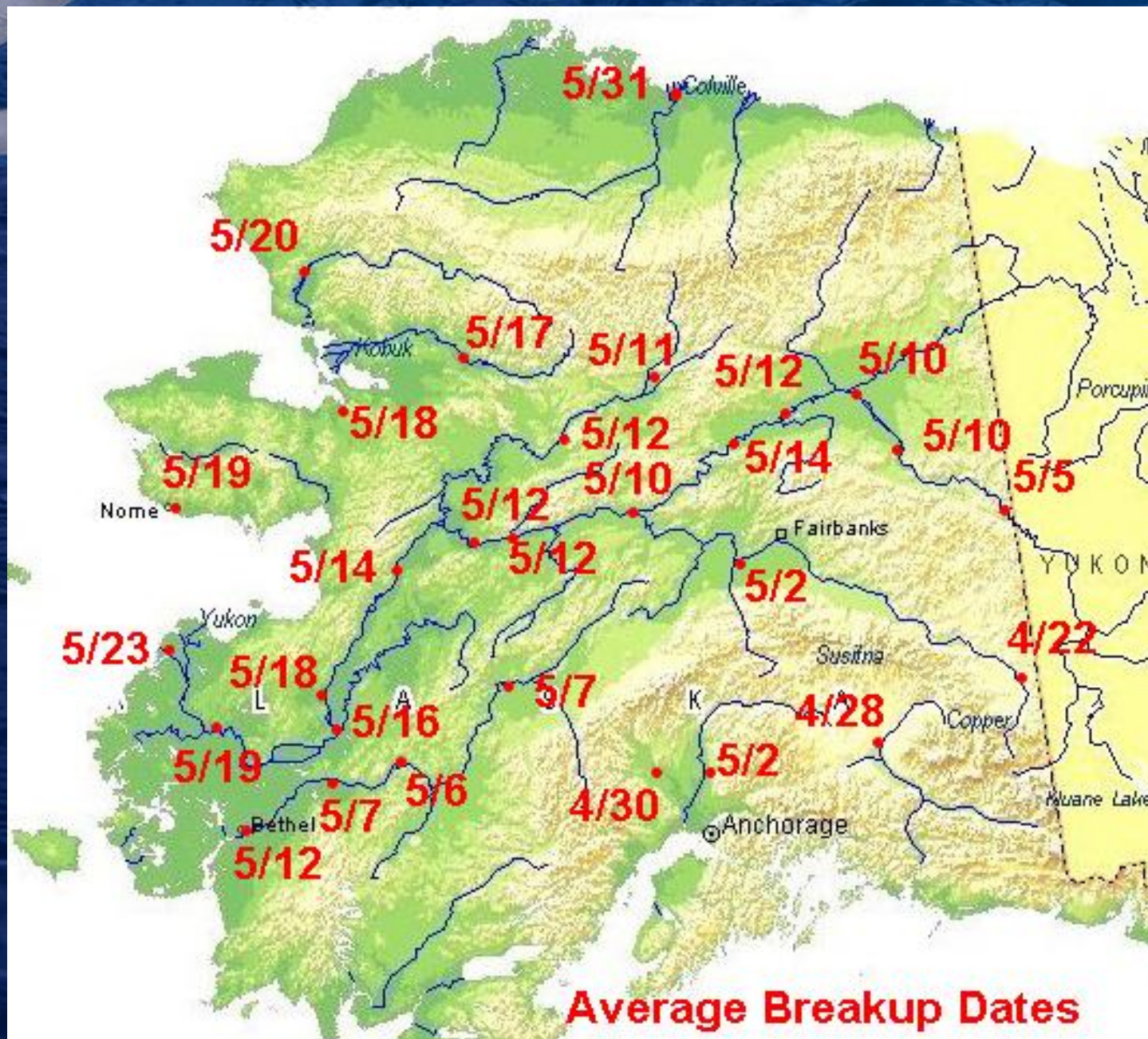
## Part 2 - Aerial photographs illustrating various ice conditions

- Breakup process varies somewhat with river size and with latitude in Alaska
- Great variability is common in ice conditions... the objective in the river PIREP is to report the predominant condition or use qualifiers (ocnl, few, mostly, etc)

Aerial photographs courtesy of APRFC staff, partner agencies, and participating commercial and private pilots



# Breakup Timing



**Average Breakup Dates**



# ***PRE-BREAKUP CONDITIONS***

## **Primary sequential phases of the pre-breakup process:**

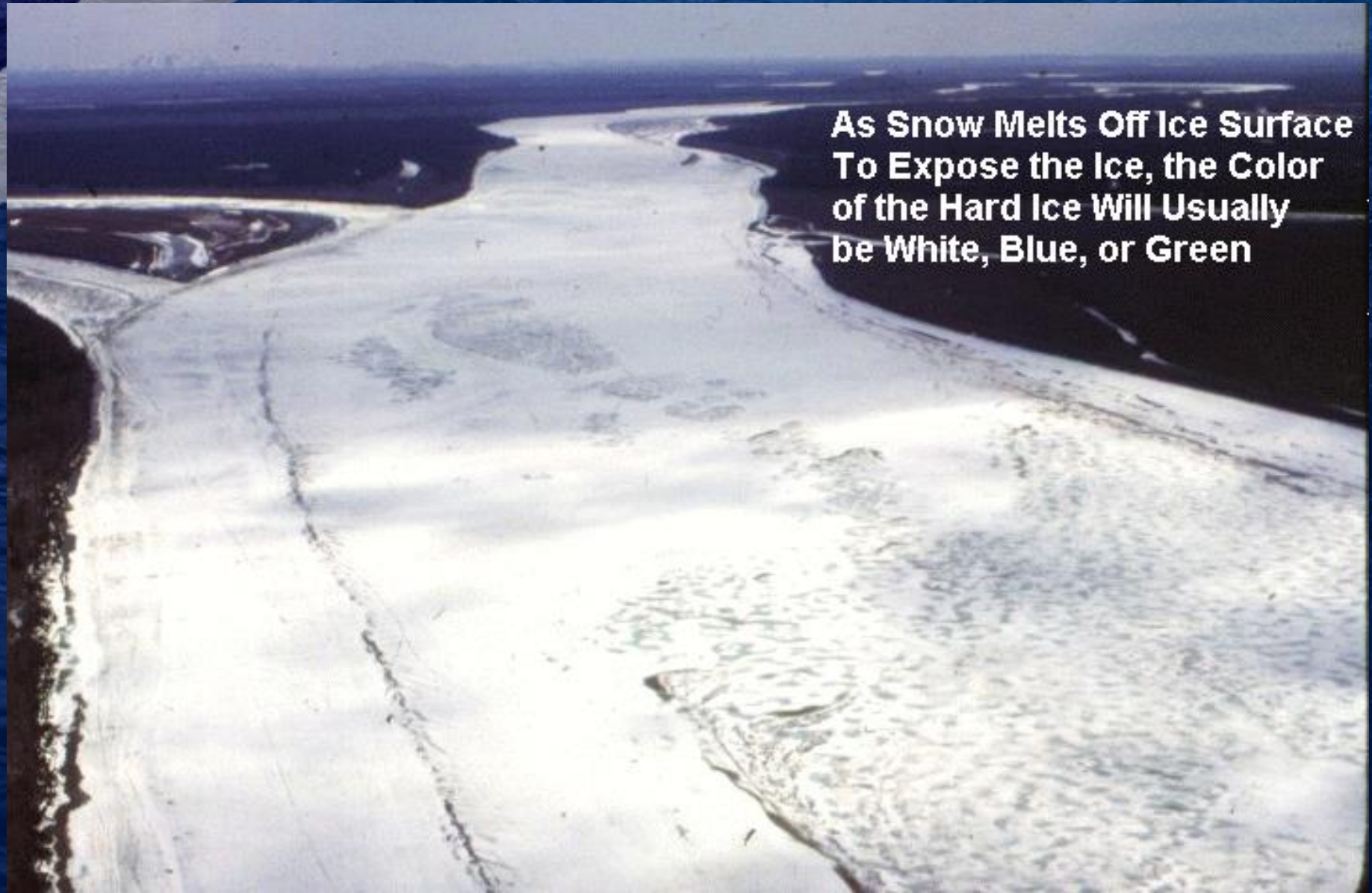
- **Unbroken ice** – continuous ice surface that has few if any cracks
- **Arched ice** – ice that is attached to the banks, which rises in the center of the channel due to increased flow beneath the ice causing melt water to collect in channels along the banks
- **Lifted ice** – ice that has broken from the banks and is floating on the river water, but is not moving; usually has river flow along both sides
- **Shifted ice** – large ice sheets that have moved short distances from their original locations as rising water levels create wider areas of open water into which the ice can move
- **Open reach** – a length of river channel with no ice that results from ice shifting a short distance down river

## **Other characteristics that may be observed combined with a phase:**

- **Open lead** - A narrow channel of open water in the ice
- **Snow on ice** – snow on the ice surface that appears white from the air
- **Clr water on ice** – snow on the ice surface that is melting and forming pools of water
- **Hard ice** – strong ice that appears white, blue or green
- **Rotten ice** – weak ice that appears black or brown



# ***UA/.../RM YUKON RIV HARD UNBKN W/ SNOW ON ICE***



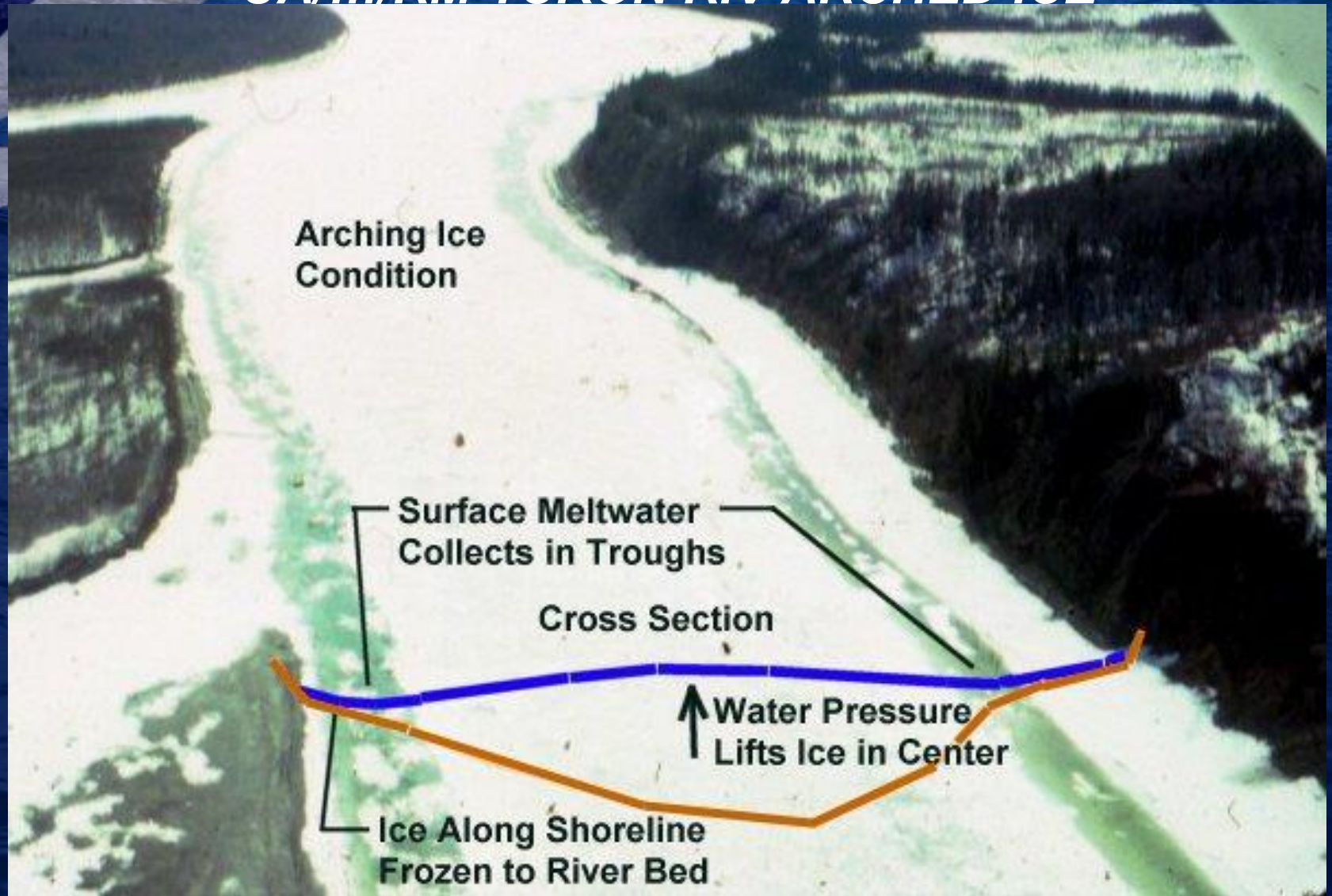
**As Snow Melts Off Ice Surface  
To Expose the Ice, the Color  
of the Hard Ice Will Usually  
be White, Blue, or Green**

**Unbroken ice** – continuous ice surface that has few if any cracks

**/OV format** – Point or Segment



# UA/.../RM YUKON RIV ARCHED ICE



**Arched ice** – ice that is attached to the banks, which rises in the center of the channel due to increased flow beneath the ice causing melt water to collect in channels along the banks

/OV format – Point or Segment



# UA/.../RM YUKON RIV UNBKN MOSTLY ROTTEN ICE

River Water Wicks  
Up Between Ice  
Candles to Darken  
Ice Surface



Rotten Canded River Ice



Rotten Canded River Ice

**Rotten ice** – weak ice that appears black or brown

**/OV format** – Point or Segment



# *UA/.../RM YUKON RIV LIFTED AND ROTTEN*

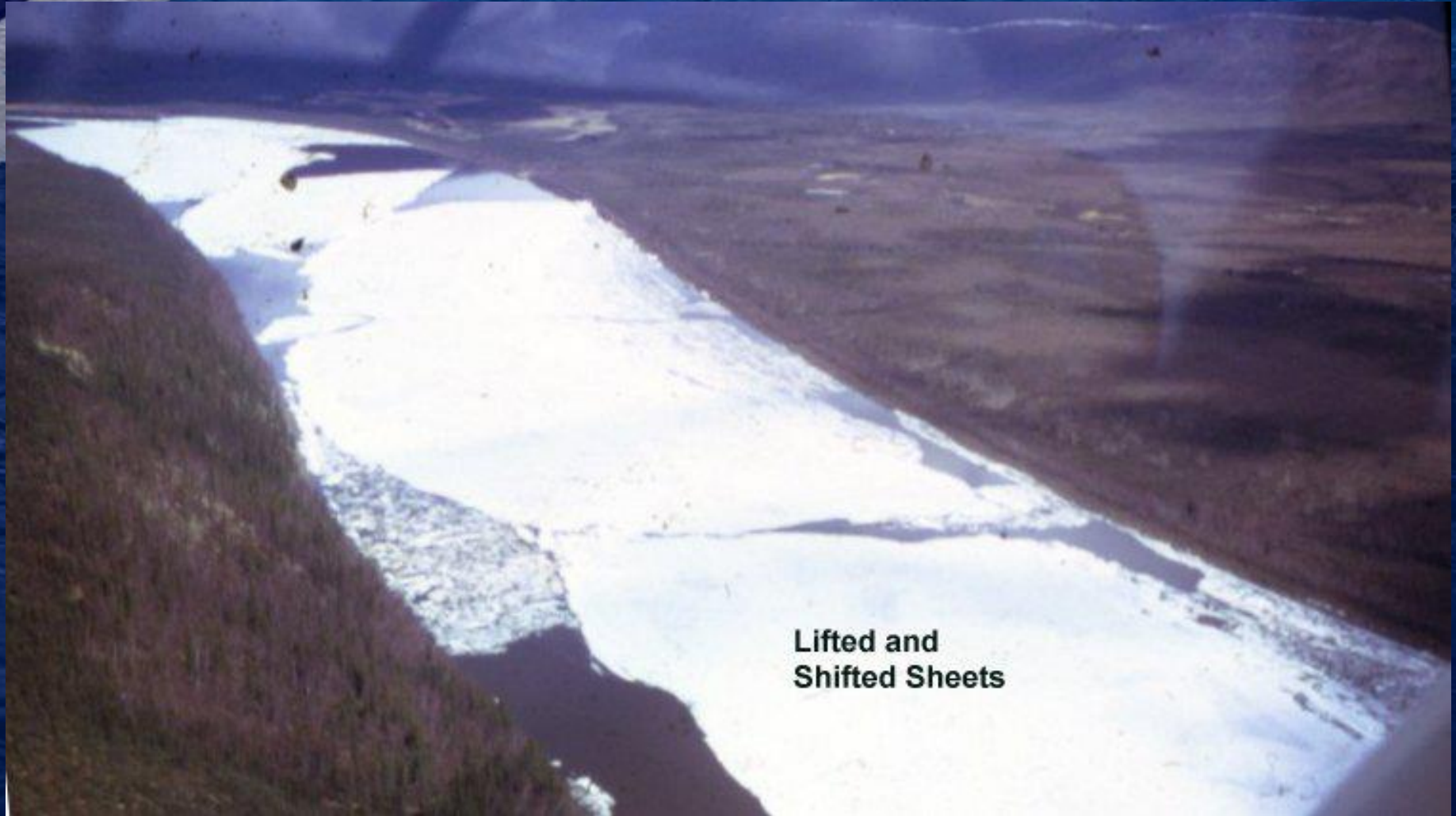


**Lifted ice** – ice that has broken from the banks and is floating on the river water, but is not moving; usually has river flow along both sides

**/OV format** – Point or Segment



# *UA/.../RM YUKON RIV HARD LIFTED AND SHIFTED SHEETS*



**Lifted and  
Shifted Sheets**

**Shifted ice** – large ice sheets that have moved short distances from their original locations as rising water levels create wider areas of open water into which the ice can move

**/OV format** – Point or Segment

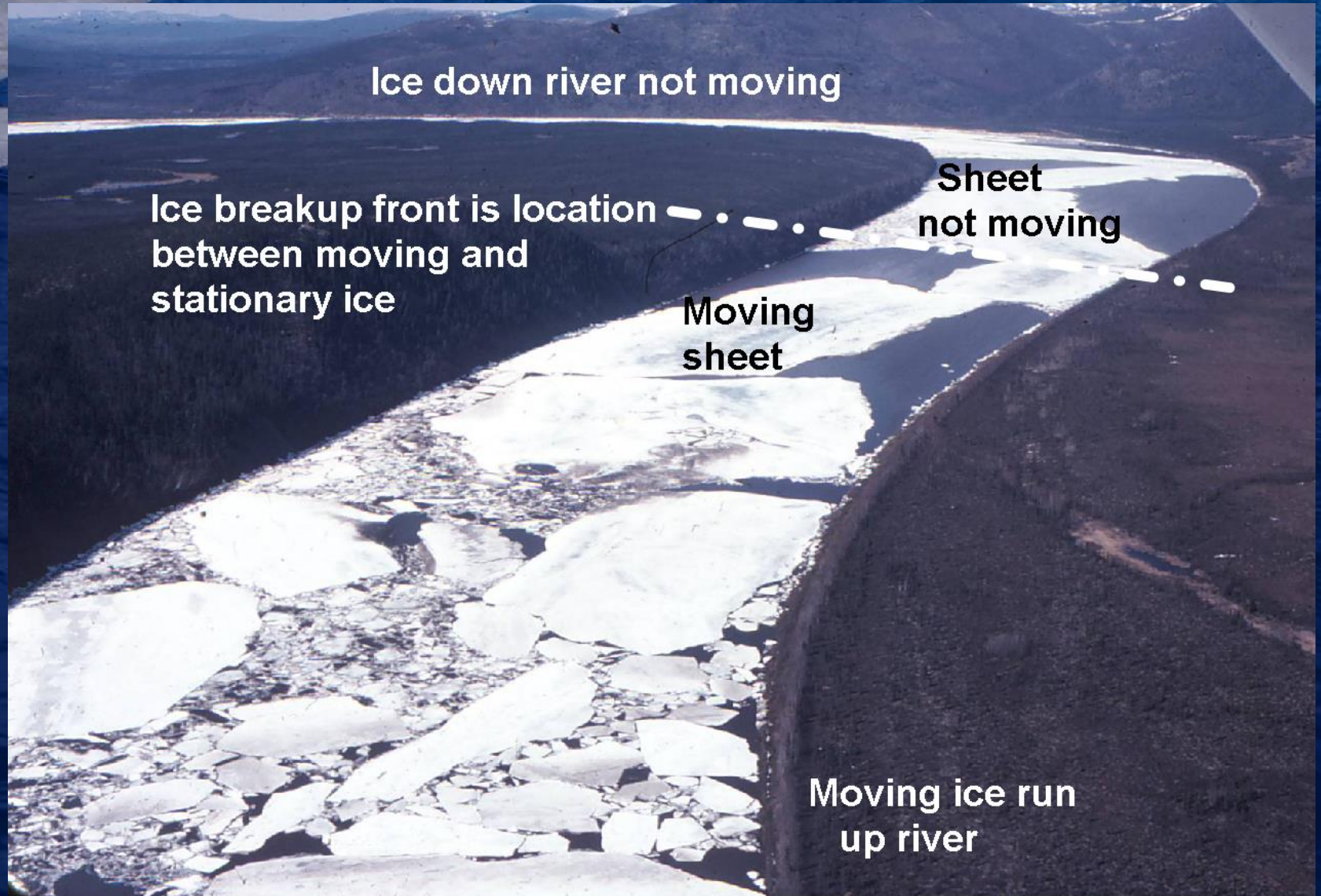


## ***MOVING ICE CONDITIONS***

- **Breakup front** – location along river between moving ice and stationary ice
- **Ice run** – a continuous length of moving ice that may be up to 10's of mi in length; typically grades from large ice pieces at downstream end to small ice pieces at upstream end
- **Ice sheets** – large pieces of ice with length greater than width and width  $> 50\%$  of river width
- **Ice pans** – pieces of ice that are 10 to 50% of the river width in size
- **Ice chunks** – small pieces of ice that are  $<10\%$  of the river width in size



# UA/.../RM YUKON RIV BREAKUP FRONT



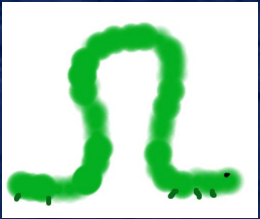
**Breakup front** – location along river between moving ice and stationary ice

**/OV format** – Point only



# ICE BREAKUP FRONT

- *Breakup date and time is when breakup front passes a location*
- *Flood threat due to an ice jam is greatest just after breakup front passes village*
- *Can be difficult to differentiate between breakup front and an ice jam*



*The ice breakup front can move down river like an inchworm... the front may stall out temporarily to wait for the back end to catch up... this would not be called an ice jam*

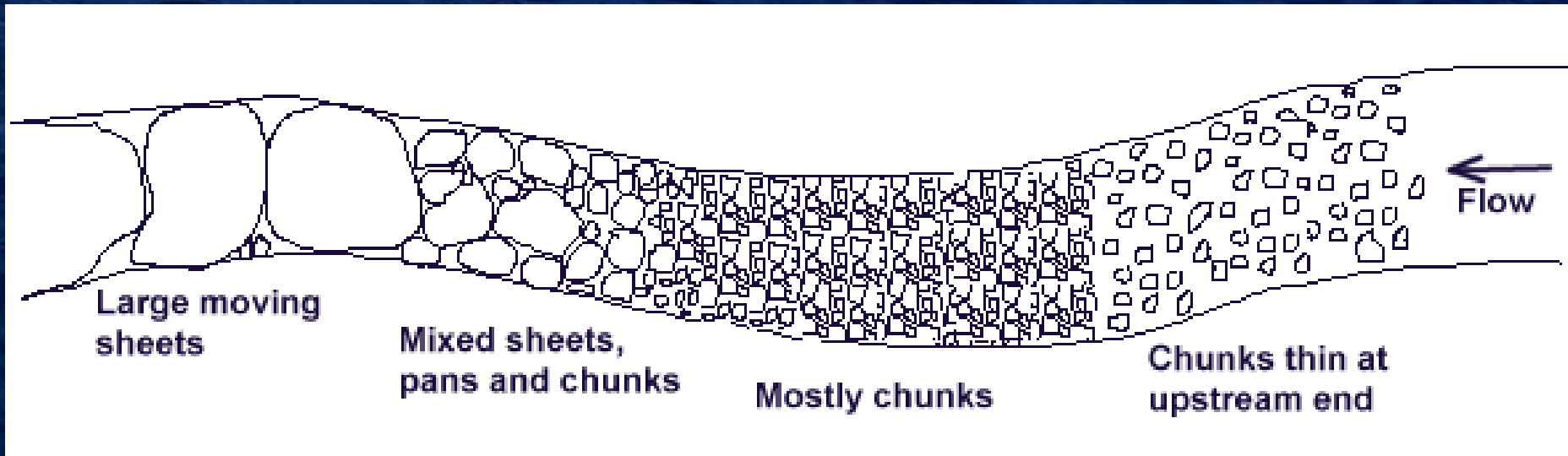
*Look for a significant amount of the ice run packing in up river from the location where the breakup front stopped... this would be an indication of an ice jam*



# TYPICAL RUN OF ICE

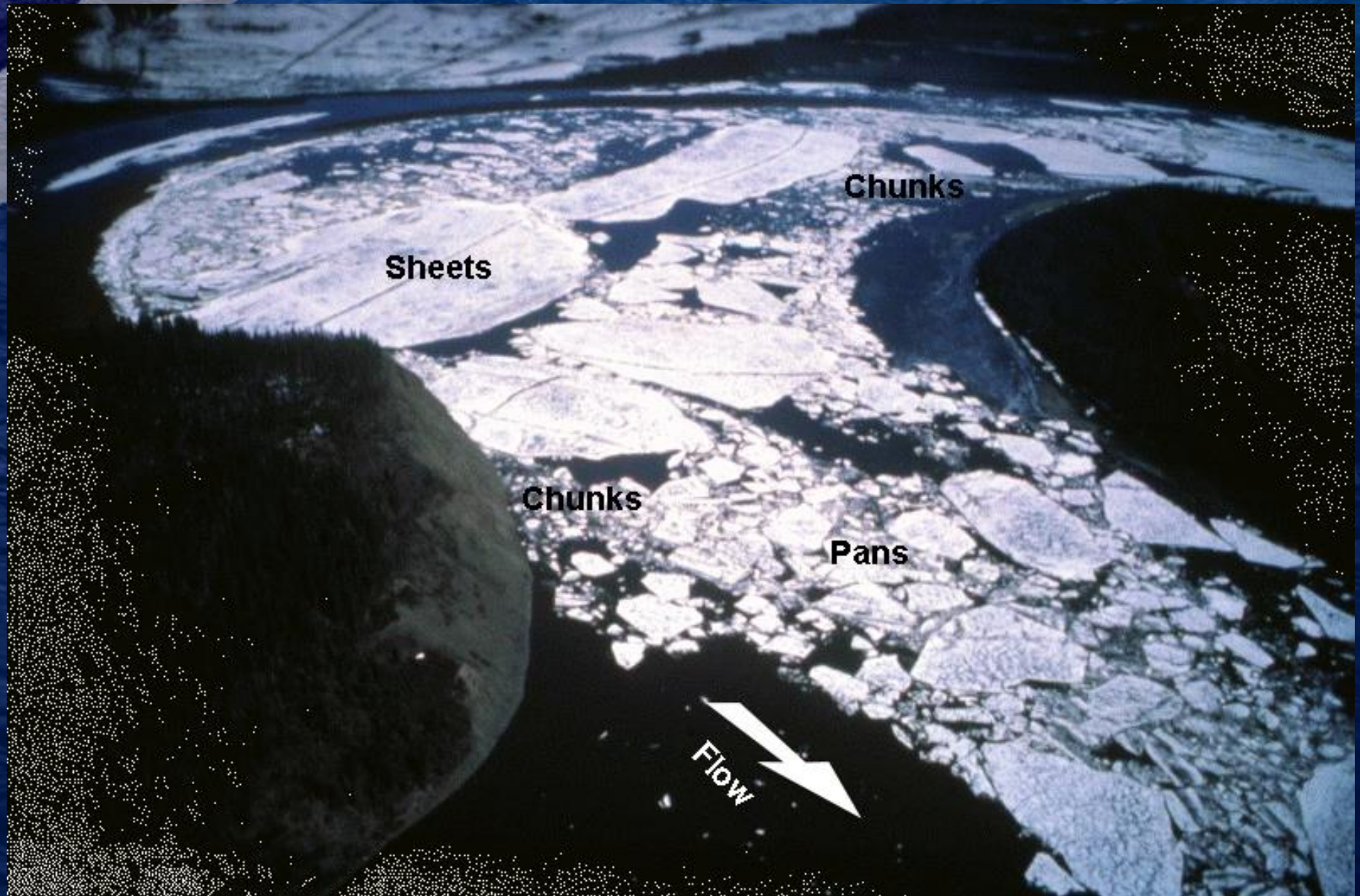
*May be 10-20 miles in length*

- *Reach of large moving sheets (nr breakup front)*
- *Reach of mixed sheets, pans, and chunks*
- *Reach of mostly chunks*
- *Subsequent runs are mainly chunks*





# UA/.../RM YUKON RIV HVY MXD RUN



**Ice run** – a continuous length of moving ice

**/OV format** – Point or Segment



# UA/.../RM YUKON RIV HVY RUN MOSTLY CHUNKS BTWN RBY-GAL

Ice Run Composed of Mostly Ice Chunks with a few Small Ice Pans

Look for Movement at Shear Line Between Stationary Shore Ice and Moving Ice Run

**Ice run** – a continuous length of moving ice  
**/OV format** – Point or Segment



# UA/.../RM YUKON RIV HVY 8 MILE LONG ICE RUN

Mostly Chunk Ice in the Ice Run Indicates that the Ice Run Has Traveled a Long Way

Shear Line

Expansion Crack



Note that a HVY ice run up river looks MOD in this wider reach of river

**Ice run** – a continuous length of moving ice

**/OV format** – Point or Segment



## *ICE JAM CONDITIONS*

- **Ice jam** – an ice run that has stopped moving due to any of a variety of reasons; characterized by a long reach of tightly packed chunk ice
- **Ice jam flood** – water spreading over the banks up river from an ice jam
- **Village flood** – water spreading into a village that covers roads or threatens buildings
- **Widespread flooding** – water that has gone over the banks and covered vast areas of land that are normally dry



## ***BREAKUP JAM***

- ***Forms when breakup front encounters a competent ice sheet or constriction***
- ***May be surface, thickened, or hanging, depending on speed of ice movement***
- ***Flood threat upstream varies with type of jam***
- ***Stream level can increase very rapidly upstream of a jam***
- ***Flood threat is greatest just after breakup front passes village***



# **UA/.../RM YUKON RIV BISHOP ROCK UNBKN; MELTING SNOW ON ICE**

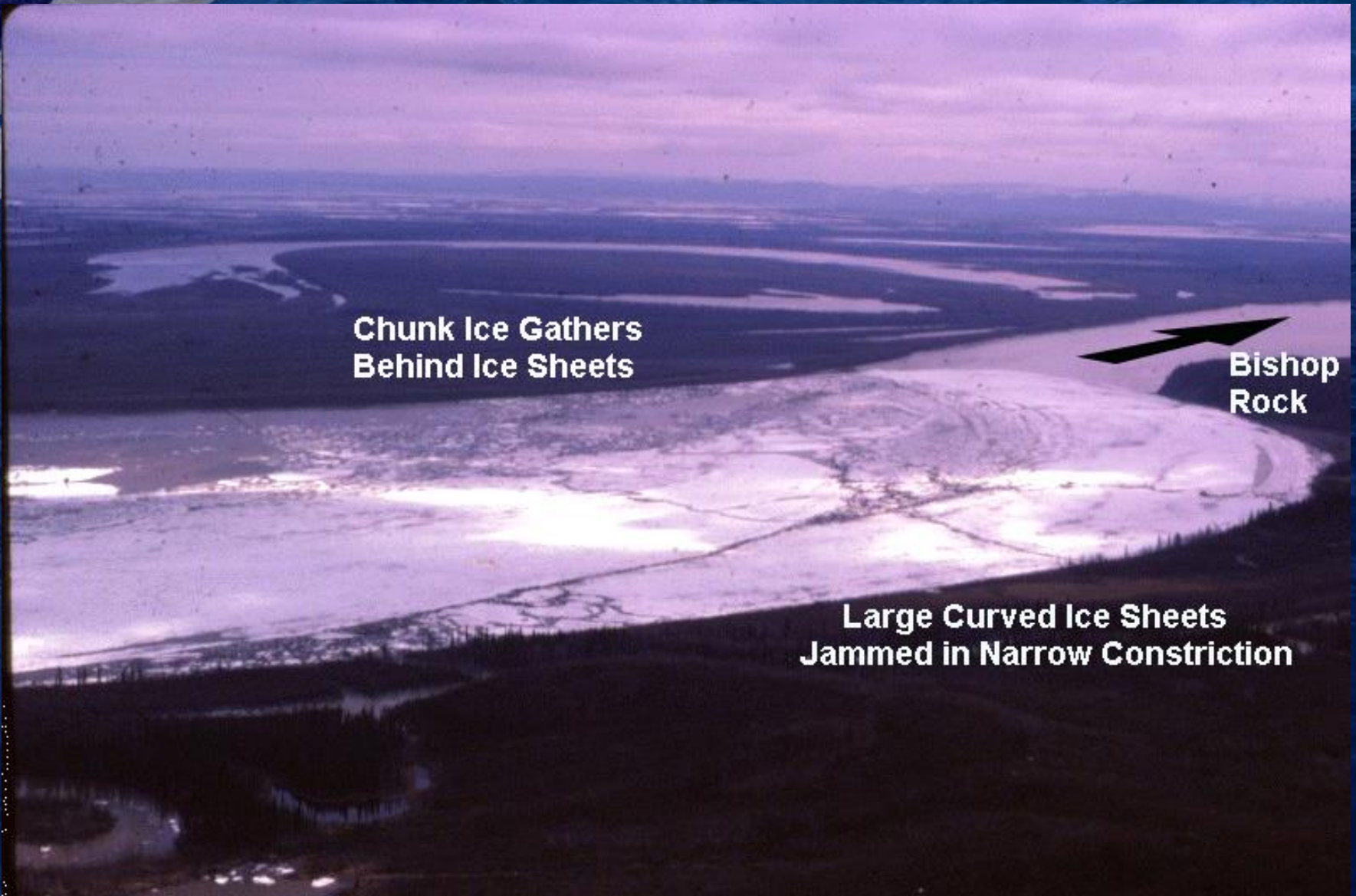
This pre-breakup photo shows the wide ice surface in the foreground that will have to go around the bend and through the narrow opening at Bishop Rock



Historic ice jam problems at Bishop Rock on Yukon and below Aniak on Kusko



# UA/.../RM YUKON RIV BISHOP ROCK APPARENT ICE JAM



Chunk Ice Gathers  
Behind Ice Sheets

Bishop  
Rock

Large Curved Ice Sheets  
Jammed in Narrow Constriction

**Ice jam** – an ice run that has stopped moving due to any of a variety of reasons; characterized by a long reach of tightly packed chunk ice

**/OV format** – Point only



## ***ICE JAM THREAT LOCATIONS***

- Ice jams can occur at any location
- Historic ice jam problems at Bishop Rock on Yukon and below Aniak on Kusko
- Threats also associated with ice conditions at and up to 10 miles down river from...
  - *Eagle, Circle, Fort Yukon, Galena, Koyukuk, Nulato, Russian Mission, Pilot Station, and delta villages on the Yukon*
  - *McGrath, Sleetmute, Red Devil, Crooked Creek, Akiak, Kwethluk, and Bethel on the Kusko*
  - *Kobuk on the Kobuk and Buckland on the Buckland*



# ICE JAM IMPACTS

*Upstream from the jam...*

- *Fast water level rise*
- *Packed ice chunks*
- *Potential flooding*





# UA/.../RM KUSKO RIV ANI VILLAGE AND RWY (10% USABLE) FLOODING

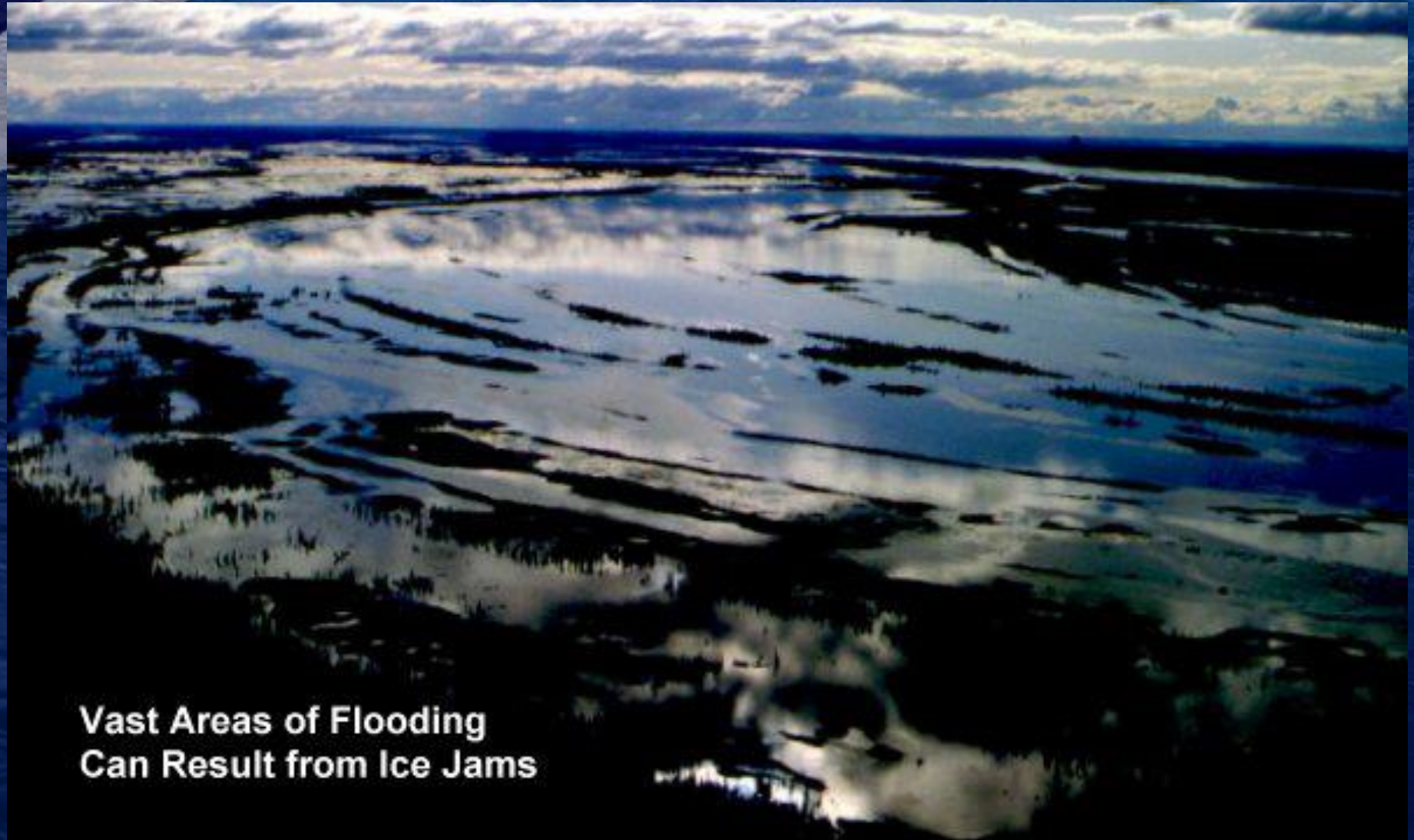


Ice Jam Flooding on  
Kuskokwim  
River at Aniak

**Village flood** – water spreading into a village that covers roads or threatens buildings  
**/OV format** – Point or Segment



# UA/.../RM YUKON RIV WIDESPREAD FLOODING



Vast Areas of Flooding  
Can Result from Ice Jams

**Widespread flooding** – water that has gone over the banks and covered vast areas of land that are normally dry

**/OV format** – Point or Segment



## ***POST-BREAKUP CONDITIONS***

- **Stranded ice** – ice pushed onto the banks or into side channels that is left behind after the ice has cleared out of the main channel
- **Open channel** – no ice in the main channel of the river
- **Ice or debris run** – a length of river channel containing moving ice or debris (trees, brush, etc) that is further categorized by amount...
  - ❖ **Light run** – <25% of surface covered
  - ❖ **Moderate run** – 25 – 75% of surface covered
  - ❖ **Heavy run** – >75% of surface covered



# UA/.../RM YUKON RIV MOD ICE RUN HVY STRANDED ICE ON SHORE



**Ice or debris run** – a length of river channel containing moving ice or debris (trees, brush, etc)

**/OV format** – Point or Segment



# UA/.../RM YUKON RIV LGT ICE RUN



05.06.2005 15:16

**Ice or debris run** – a length of river channel containing moving ice or debris (trees, brush, etc)

**/OV format** – Point or Segment



# *UA/.../RM KOYUKUK RIV OPEN HVY STRANDED ICE ON SHORE*



**Stranded ice** – ice pushed onto the banks or into side channels that is left behind after the ice has cleared out of the main channel

**/OV format** – Point or Segment



# UA/.../RM KOYUKUK RIV OPEN MOD STRANDED ICE ON SHORE



**Stranded ice** – ice pushed onto the banks or into side channels that is left behind after the ice has cleared out of the main channel

**/OV format** – Point or Segment





## Part 3 - River PIREP format and terminology

- Pilots are familiar with pilot reports (PIREPs) for documenting weather impacts to flight
- River PIREPs supplement a normal PIREP with observations of notable or changing conditions on a river
- Although river PIREPs can be given at any time of year for any condition, the initial emphasis concentrates on ice breakup observations
- Lake ice information can also be included in a river PIREP but must still include RIV in remark



# PIREP FORMAT

- UA or possibly UUA for severe flood report
- /OV - Point or route segment format
- /TM – UTC time of event observed
- /FL – Assists weather evaluation and observation resolution
- /TP – Assists weather evaluation
- /SK – Assists weather evaluation
- /WX – Assists weather evaluation
- /TA – Assists weather evaluation
- /WV – Assists weather evaluation
- /TB – Assists weather evaluation
- /IC – Assists weather evaluation
- /RM – Heart of the river report

Items highlighted in red are considered to be the most important part of the PIREP for use in river ice assessments but weather reports are encouraged



## ***/OV – LOCATION FORMAT***

- Point format (e.g. /OV MCG18030) is useful to describe specific location of an ice feature such as breakup front, ice jam, downstream end of ice run or flooded village
- Segment format (e.g. /OV SRV-SLQ) is useful to describe ice or flooding conditions along a reach of river
- Optional format to specify river mile in the remark section (maps w/river miles for some rivers available on program web site)



## */RM - REMARK FORMAT*

- */RM name RIV description*, where ...
  - *name* is the name of the river or lake
  - *RIV* is a key identifier for the NWS and *must be included* even if it is observations of lake ice
  - *description* is an abbreviated description of the observed ice conditions

### **For Example....**

*FAI UA/OV GAL270013/TM 2355/FL060/TP C207/RM YUKON RIV BISHOP  
ROCK APPARENT ICE JAM*



# *STANDARD RIVER PIREP REMARKS*

## *PRE-BREAKUP CONDITIONS*

### *GENERAL*

- UNBKN
- ARCHED
- LIFTED
- SHIFTED
- OPEN

### *SUPPLEMENTAL*

- HARD
- ROTTEN
- SNOW ON ICE
- CLR WATER ON ICE
- MUDDY WATER ON ICE
- OPEN HOLES
- OPEN LEADS
- FLOW IN SIDE CHAN
- FLOW ON ICE



# STANDARD RIVER PIREP REMARKS

## MOVING ICE

### GENERAL

- BU FRONT
- ICE RUN...
  - MIXED
  - SHEETS
  - PANS
  - CHUNKS
- X MI ICE RUN  
(LENGTH = X)

### ICE RUN DENSITY

- HVY (>75%)
- MOD (25-75%)
- LGT (<25%)



# ***STANDARD RIVER PIREP REMARKS***

## ***ICE JAM AND FLOODING CONDITIONS***

### ***ICE JAMS***

- **APPARENT ICE JAM**
- **ICE JAM**

### ***FLOODING***

- **VILLAGE NAME FLOODING**
- **RWY FLOODING (% USABLE)**
- **WIDESPREAD FLOODING**
- **LOW-LYING FLOODING**





**ANY  
QUESTIONS????**



# *River Watch*



## **Part 4 - Tips on taking aerial photographs of river ice**

*Prepared by Tom George  
Alaska Regional Representative  
Aircraft Owners and Pilots Association*





# Overview

- Tips on taking pictures
- Transmitting pictures via e-mail to the River Forecast Center



# Tips on photographing

- Don't wear *bright clothing* which may reflect in the windows of the aircraft
- Keep upper body away from airframe to avoid transmitting vibrations to the camera
- Use a *high shutter speed* to avoid image motion
- If possible, *open the aircraft window* to improve the quality of the images—check with the pilot first!
- Use an *intercom system* to aid communications between pilot and photographer



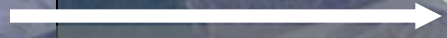
An aerial photograph of a river valley. A road runs vertically on the left side. The river winds through the valley, with several meanders. The terrain is mostly forested. In the distance, there are mountains and a large body of water. A text box in the bottom right contains text about forward scattering. An arrow points from the text 'Sun Direction' to the upper part of the image.

Sun Direction

When photographing into the sun, “forward scattering” tends to enhance haze and obscure ground features.



Sun direction

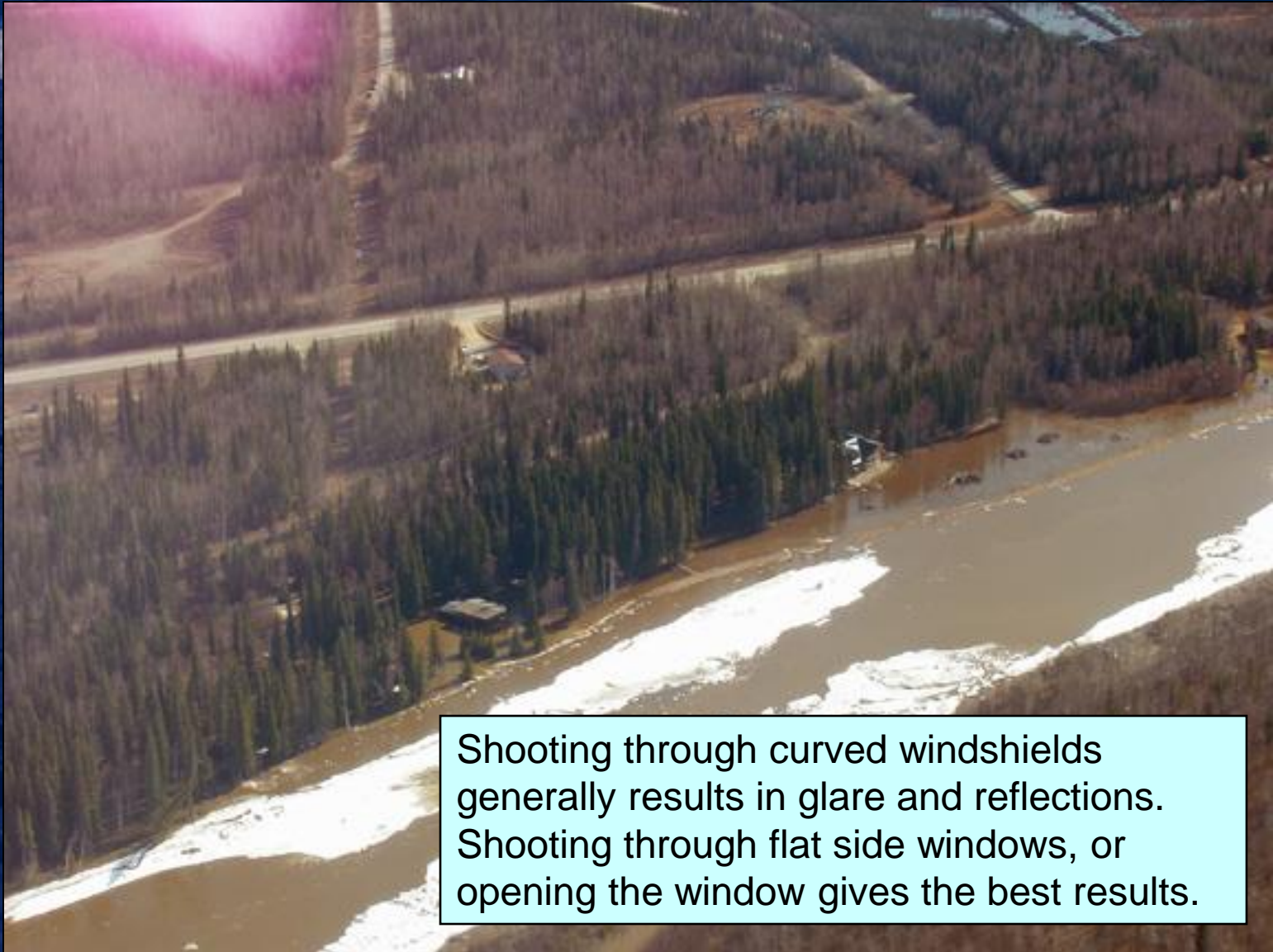


Shooting “down sun” minimizes haze,  
resulting in a sharper image.





# Glare and reflections



Shooting through curved windshields generally results in glare and reflections. Shooting through flat side windows, or opening the window gives the best results.

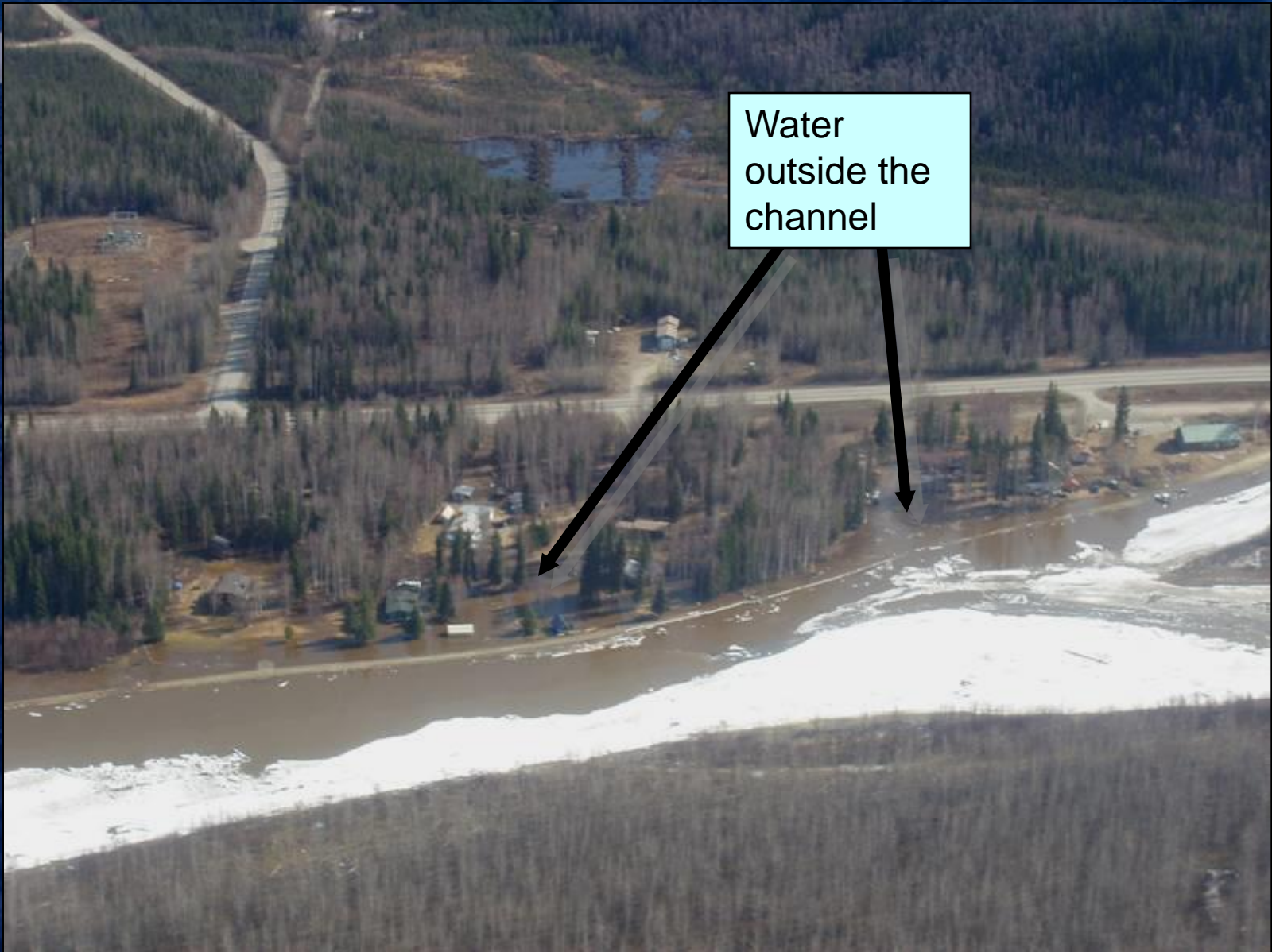


# Setting up the picture

- Identify the feature you plan to photograph
- Consider the lighting
- Consider the best angle to show the feature
- Position the aircraft relative to the target
  - Typically, behind the strut on the photographer's side of the aircraft
- Take the photograph
- Record the location, time and other significant features:
  - Ice type, jam, flooding, etc.



# Flooding impact



Water  
outside the  
channel



# Wait for the target...

Target area



Too far to see detail



Good detail and reference locations



# Focal length of camera



Wide angle shot



Zoomed in telephoto image

- Use wide angle lens to show larger area
- 35 mm lens on a 35 mm film camera
- Easier to:
  - See the “big picture”
  - Identify land marks



# Viewing angle



- Generally better to shoot up or down stream

- Cross stream is harder to:

- Establish location
- See ice details





# Flight altitude

- ~3,000 feet *above ground level* is a good altitude for general observations
- Lower shows more detail, but a lot less area
- Higher is some times useful to show the “big picture”





Example:  
Tanana River, looking  
upstream, into the sun,  
from ~3,000 feet agl.



Example:  
Confluence Chena and  
Tanana, down sun, ~3,000  
feet agl.





# Transmitting digital pictures to NWS River Forecast Center

- Images and text transmitted via e-mail:
- Image size ~ 7 x 10 inches, 100 pixels/inch
- Jpeg, factor 8 – 10
- Compresses to image size of ~200K
- If sending many images, may need to spread across several e-mail messages due to 20MB limit

Send to: River Forecast Center  
[nws.ar.aprfc@noaa.gov](mailto:nws.ar.aprfc@noaa.gov)

Or call: (800) 847-1739



*Thanks for your help*

# *River Watch*



<http://aprfc.arh.noaa.gov/rivwatch.php>