20220927 If trees could fly

Last night, approaching dusk, end of a long wet gale, power went out in our Highlands neighborhood. Shortly afterward heard sirens leaving the fire department. AELP outage page had Gastineau Ave reports of ground-shaking. Cathy P & I went out with Koren to loop the Seawalk, admiring darkness on Sayéik and much of town. Power came back on as we returned to the Highlands. Cathy C texted me AELP pics of a tree spanning Gastineau Ave. Today, went over for a look.

I guess this qualifies as a *Geol-393* fieldtrip of sorts, although no students were with us. Perfect timing for demonstrating relevance of our forthcoming Saturday tour of mass wasting landforms in this area. Our friend Terry Schwarz owns the 3-story on left that was lightly damaged. [1] Uphill neighbor Jin Mitchem—not so lucky—although he did manage to be working late and not inside when this hit yesterday.

Photographer/dronepilot Sean Neilson and I walked uptown, meeting longtime neighborhood resident Aaron Brakel at marine park. Pat Dryer from ADOT had a drone in the air as we arrived, but Tom Mattice said we could fly when he was done. Sean was in the air maybe 20 minutes, and got pretty total coverage, top to bottom.

But it's a narrow chute, heavily overhung by fringing conifers. Also, clouds were sifting over the starting zone, and the top-video's murky. Sean's chute descent, stitched in ICE on next page, together with this stereo-pair, tells the lower-half story pretty well.

1 Learned later that C Connor first met Terry & Shannon as students and later officiated at their marriage!

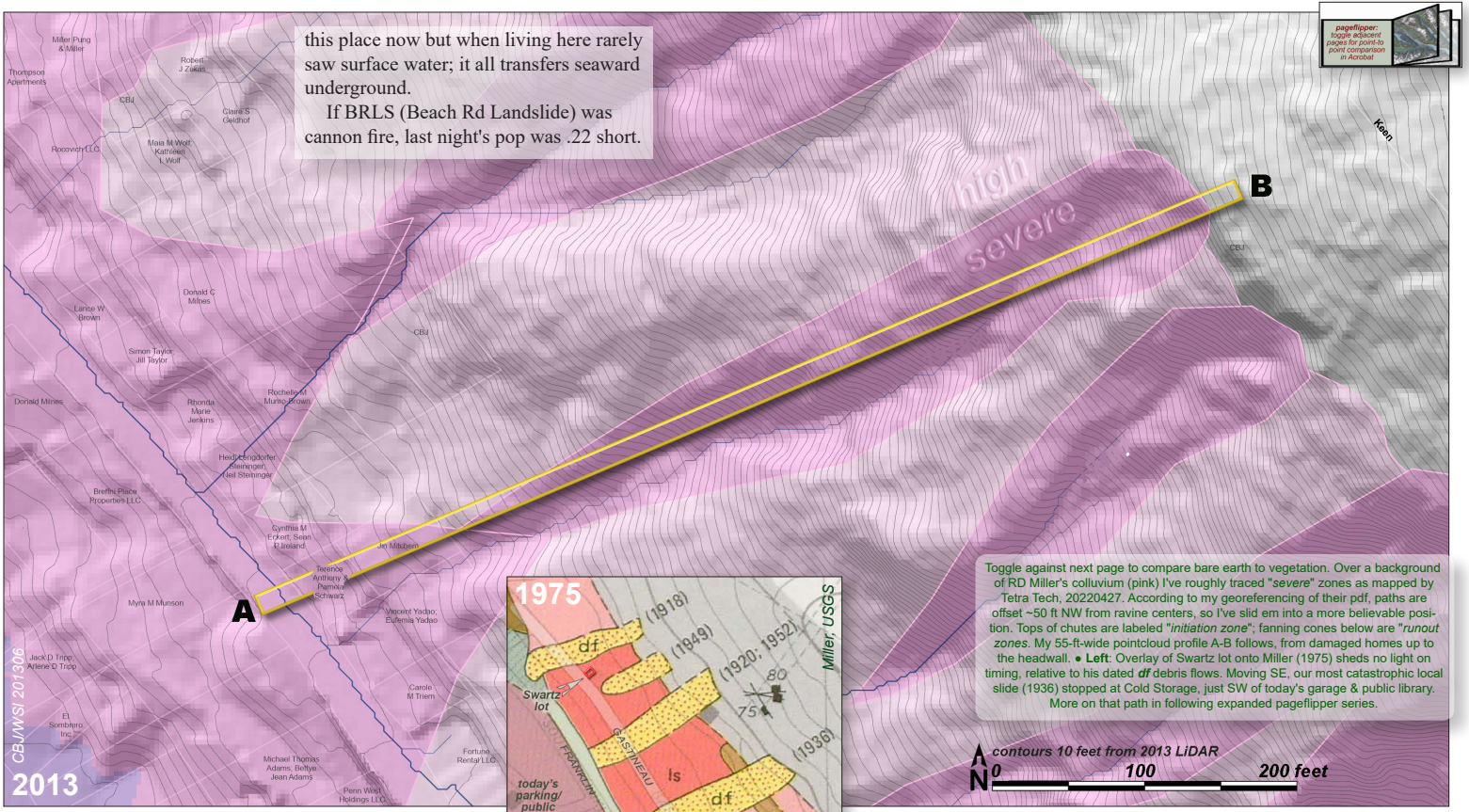
st06 3D from crab I asked Sean to drift sideways at several levels and camera-angles, so I could extract stills for stereo-pairings a few seconds apart. I hadn't noticed on 2D pics how much debris is mounded up here.

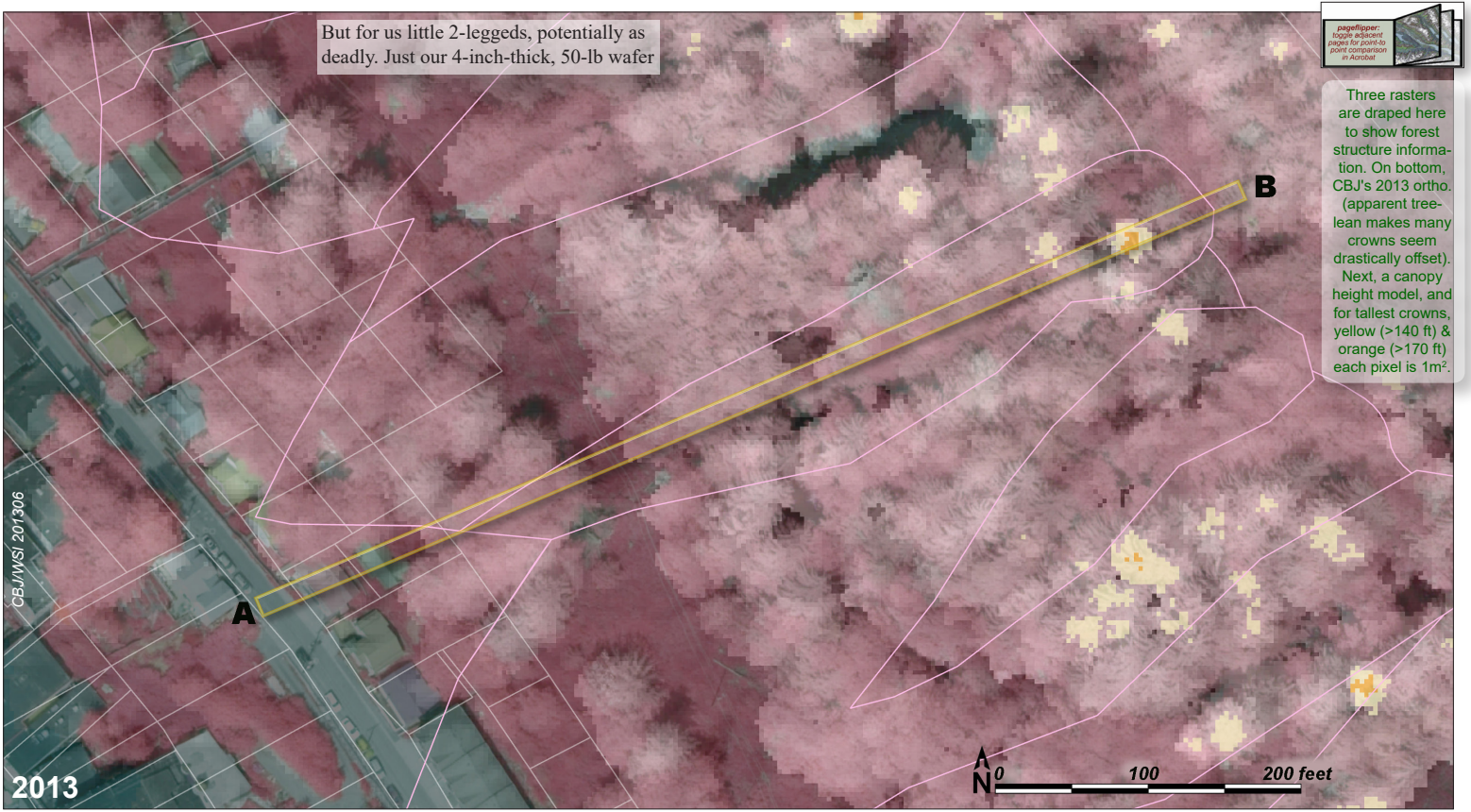
Aaron grew up in a house 100 yds NW from this chute—lot now owned by Claire Geldof, upper left of following hillshade—and this hillside was his playground. Studying the 'flying spruce' who came down butt first, he was pretty sure he recognised it as the 'capstone' tree, from top of what Tetratech calls an "*initiation zone*." Contours

from CBJ LiDAR place this inflection at about 650 feet. Aaron was curious about the age of this spruce, and asked Tom if he could get a cookie when tree service folks came to buck it up. I got a call from Tom, next day, saying he had one for us. It's a beauty, resting under our bike canopy right now, bound for a drying place and planer. Aaron's decided Discovery is the logical keeper. After all, it's 42 inches in diameter and weighs around 50 pounds *:)* [2] Lovely—if less than portable—teaching aide.

stitch2 Bottom half Not rectified, and crowns at top appear larger because drone was closer to ground up there. Spruce, hemlock and alder are easily distinguishable from canopy shape and color (spruce greyer green, starry, radiating branches). These powerlines survived, but a pole on the street was tipped outward. Haven't seen Terry in years (cept performing at folkfest) so it was good to catch up. He seemed zenishly 'present' and undistracted. Rents

2 My first estimate was 100 lbs, but when Merli and I later wheeled it out to his Leaf, we down-graded that to about 50 lbs, wet-weight.


this place now but when living here rarely saw surface water; it all transfers seaward underground.
If BRLS (Beach Rd Landslide) was cannon fire, last night's pop was .22 short.
pageflipper: toggle adjacent pages for point-to point comparison in Acrobat
high
severe
A
B
Keen
CBJ
Miller Pung & Miller
Thompson Apartments
Robert J Zilkie
Claire S Geldhof
Rocovich LLC
Maia M Wolf Kathleen L Wolf
Donald C Milnes
Lance W Brown
Simon Taylor Jill Taylor
Donald Milnes
Rhonda Marie Jenkins
Rochelle M Murno-Brown
Heidi Lengdorfer Denmgan Neil Steininger
Brefhi Place Properties LLC
Cynthia M Eckert; Sean P Ireland
Jay Mikdeci
Terence Anthony & Pamela Schwarz
Myra M Munson
Vincent Yadao; Eufemia Yadao
Jack D Tripp Arlene D Tripp
Carole M Triem
El Sombrero Inc
Michael Thomas Adams; Bettye Jean Adams
Fortune Rental LLC
Penn West Holdings LLC
CBJWSI 201306
2013
1975
(1918)
df
(1949)
(1920; 1952)
80
75
Miller, USGS
Swartz lot
GASTINEAU
FRANKLIN
ls
(1936)
today's parking/ public library
gt
mm
Toggle against next page to compare bare earth to vegetation. Over a background of RD Miller's colluvium (pink) I've roughly traced "*severe*" zones as mapped by Tetra Tech, 20220427. According to my georeferencing of their pdf, paths are offset ~50 ft NW from ravine centers, so I've slid em into a more believable position. Tops of chutes are labeled "*initiation zone*"; fanning cones below are "*runout zones*. My 55-ft-wide pointcloud profile A-B follows, from damaged homes up to the headwall. • **Left**: Overlay of Swartz lot onto Miller (1975) sheds no light on timing, relative to his dated ***df*** debris flows. Moving SE, our most catastrophic local slide (1936) stopped at Cold Storage, just SW of today's garage & public library. More on that path in following expanded pageflipper series.
contours 10 feet from 2013 LiDAR
N
0
100
200 feet

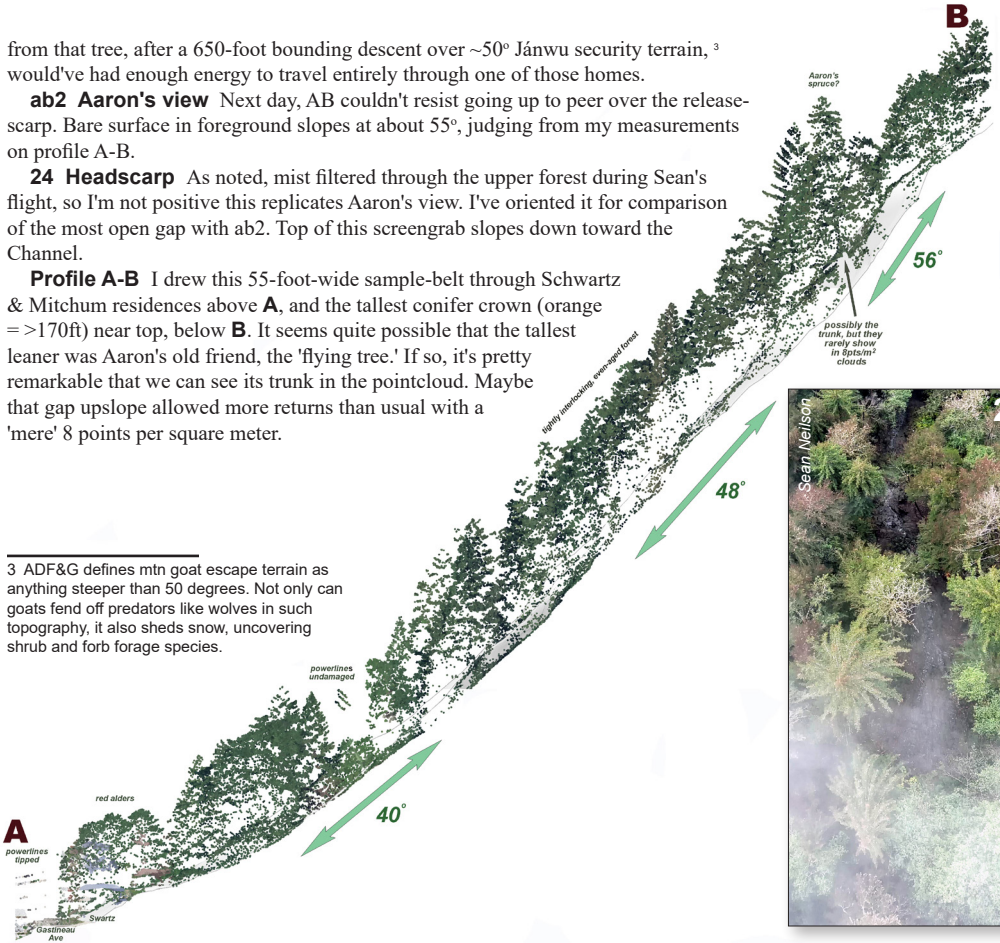

But for us little 2-leggeds, potentially as deadly. Just our 4-inch-thick, 50-lb wafer
pageflipper: toggle adjacent pages for point-to point comparison in Acrobat
Three rasters are draped here to show forest structure information. On bottom, CBJ's 2013 ortho. (apparent tree-lean makes many crowns seem drastically offset). Next, a canopy height model, and for tallest crowns, yellow (>140 ft) & orange (>170 ft) each pixel is 1m².
A
B
CBJWSI 201306
2013
N
0
100
200 feet

from that tree, after a 650-foot bounding descent over ~50º Jánwu security terrain, [3] would've had enough energy to travel entirely through one of those homes.

ab2 Aaron's view Next day, AB couldn't resist going up to peer over the release-scarp. Bare surface in foreground slopes at about 55º, judging from my measurements on profile A-B.

24 Headscarp As noted, mist filtered through the upper forest during Sean's flight, so I'm not positive this replicates Aaron's view. I've oriented it for comparison of the most open gap with ab2. Top of this screengrab slopes down toward the Channel.

Profile A-B I drew this 55-foot-wide sample-belt through Schwartz & Mitchum residences above **A**, and the tallest conifer crown (orange = >170ft) near top, below **B**. It seems quite possible that the tallest leaner was Aaron's old friend, the 'flying tree.' If so, it's pretty remarkable that we can see its trunk in the pointcloud. Maybe that gap upslope allowed more returns than usual with a 'mere' 8 points per square meter.



3 ADF&G defines mtn goat escape terrain as anything steeper than 50 degrees. Not only can goats fend off predators like wolves in such topography, it also sheds snow, uncovering shrub and forb forage species.

25 Cookie Once it's sanded and better photographed, we'll ask Eran's Montana tree-guys to check out this cookie and see what they think of the scars. Meanwhile, here's my speculative and untrained interpretation:

● Asymetrical pith means tree was a leaner—most oldsters on ultrasteep slopes lean downhill due to soil or snow-creep, plus branchier & lopsided toward channel side, so they're also more weighted in that direction.

● In support of that, scarring from rocks is on the narrow-ring side, *ie*, slamming the trunk from above. They struck 15-to-20 feet up, which means it was still really steep uphill from this tree. On preceding profile, slope eventually mellows moving upward onto Chuck Keen's bench, says Aaron, but it's easy to imagine several bombardments per century.

● Of course, Eran's team are more interested in big snow avalanche recurrence interval, and I doubt that happens here. It's one thing for some rocks to clatter down, and another for a freight train of logs to careen 650 feet out across the road.

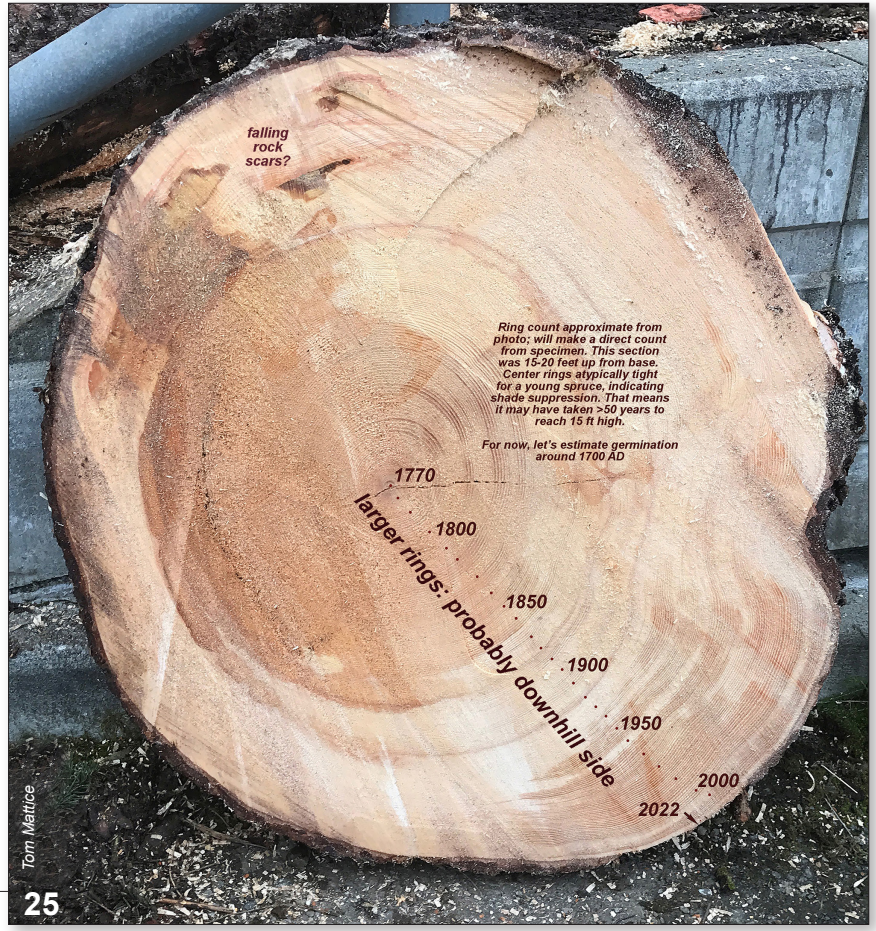
● Center rings are extremely tight for a spruce—more like the typical forest-grown hemlock pattern. It was probably quite shaded in youth, and could have taken many decades to reach the ~15-foot level of this cookie. That's why I've pushed back estimated germination-year from the ~1770 pith to around 1700AD.

● On flip side there are sectioned branches that don't extend inward to pith. These are epicormic branches, on the fat, channel side, indicative of suddenly increased lighting. I haven't yet counted, but this happened ~50-100 years ago. Would be cool if epicormics started growing just after 1918.

● Flipside also has some beautiful healing-rings, folding inward, that should allow exact-year dating of rockfall injury.

● Two bands of dark-stained rings run almost all the way around. I don't know what causes this.

PS: We've looked at the cookie with STEAM-2022 teachers, and with KTOO reporter Claire Stremple: audio & article with pics. Flipside from Tom's pic here has a textbook rockscar. More will follow, after sanding, & pic-reviews from Montana experts.



20221001 Teacups,[1] gravity & gushers

Cathy Pohl drove to the airport at 4 am in a gale. I'd been planning on dropping her but seemed probable she'd need the car to get back home when/if flight cancelled. Sure enough, she soon returned. Five hours later, *Geol393* assembled at the Whale under calm, clearing skies—2 vans and some private cars—where I had time to scope the shoulder of Shaa Tlaax̲, *moldy top* (Mt J) before heading out on our colluvium tour. Notes on whitethings are in today's *Goatlandia journal*.

04 Runthrough We've demonstrated stereo in this class, but said little about how to prepare your own. In 2D it's pretty hard to make sense of a jumbled scene like this one, so I recommended folks try taking a pair of cellphone shots in portrait mode, spaced several feet apart, after downloading assembled side-by-side with any image-processing app. Largest log is the one we got a cookie from.

First line of trees upslope behind the houses are paler-green, round-topped red alders. Compare to preceding pointcloud profile A-B. Beyond that is a fairly closed conifer stand.

1936 Landslide November 22 saw 14 people killed in a debris avalanche from an already-raw slope below AJ tram. Debris piled against Public Cold Storage (since replaced by open lot just SW of our Marine Parking Garage), and it was a week before all bodies were recovered. The *usdeadlyevents* site, collecting accounts from multiple historical news outlets, indicates that another slide came down the same path on December 2nd, which should give pause to rescue workers, and simple loiterers—such as our class—who promptly ignored my suggestion to shoot a quickie (or 2, for 3D), then step out of the bowling lane.

1 I'll get to the teacup-watershed idea at end of today's journal. It dates back to a teacup-vs-saladbowl, landform-&-veg hypothesis on pages 24 & 25 of *Natural history of Juneau trails: A watershed approach*. (2013).

In fact, witnesses to the 19361122 landslide said it came down in 2 pulses:

> *"The first slide was soon followed by a second slide, which was worse. The second slide cut a swath 100 feet wide and ranged from 10 to 40 feet deep."*

Tracing, georeferencing & adjusting Tetra Tech zones and delving into these archives makes me want a slightly scaled-out look at channelside slopes—both spatially and temporally. Let's expand our pageflippers southward to today's Marine Parking Garage, and throw in some historical nadirs, to trace these paths back in time.

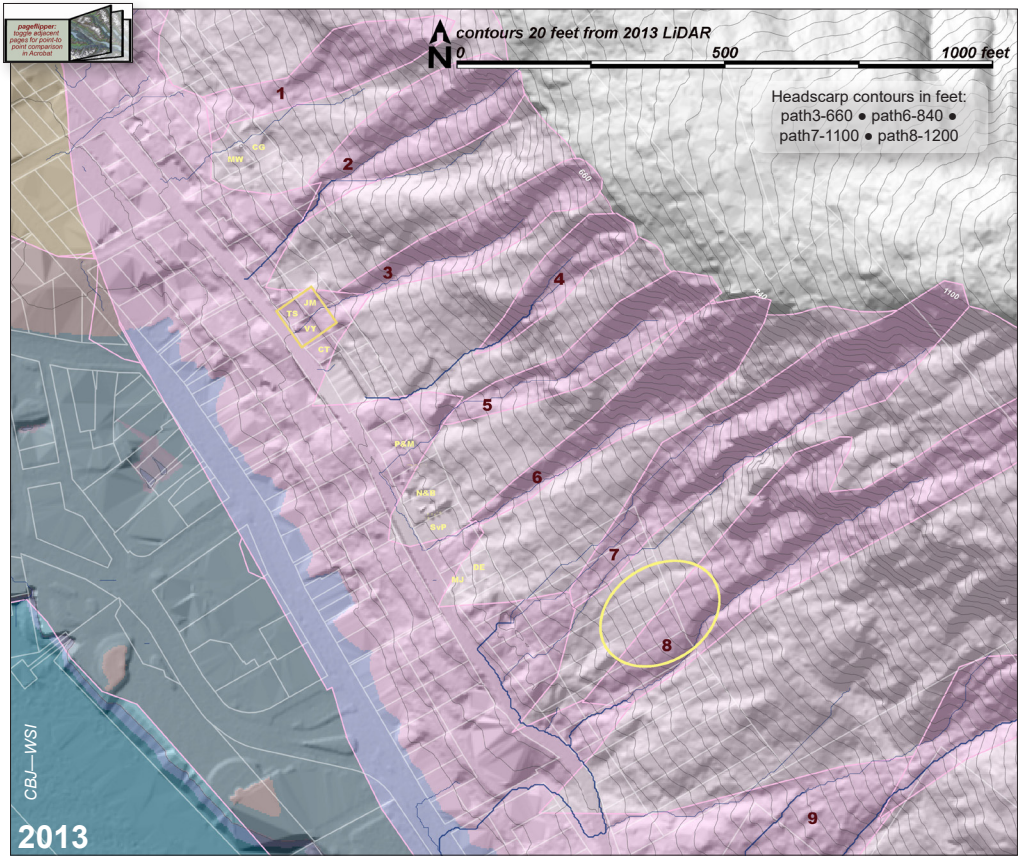
Gastineau Avenue pageflippers

On our field trip I noticed in the pocket 35mm stereo-slideviewers for both 1929 & 1962, a raw landslide scar extended from AJ railway or tram down to Gastineau Ave. Could this have been our newly 'refreshed' path? Nope. Turns out it was the one that ran disastrously in 1936.

1st of 6 pageflippers My slidepath boundaries are not identical to Tetra Tech's, and numbers here are mine, not corresponding to any other system. Path 3 is the one that just ran on 0926. Note that only path 6 maintains an equally deep V-notch shape all the way down to residences. [2] Did this shape focus and lengthen the travel of our flying-tree?

On all 6 of these pageflippers I've placed a yellow box around the 3 parcels where homes were damaged on 0926.

Toggling against Cold Storage views in 1962&84 indicates path 8 is the fatal one that ran in 1936. It has a great deal more relief than paths 1 thru 6, but didn't need it to be deadly, as we'll see. My yellow oval, carried over from



2 Path 6 runs between Nancy & Bill's, and MJ & Dani's. I added initials here to parcels of friends along the uphill side of Gastineau Avenue.

following 1926 aerial, is the area that was already raw a decade *before* the fatal release. According to Doug Swanston (1972) the 1936 slide:

> *"occurred as a result of failure, just below the tram and above the Cold Storage building on November 22, 1936. This landslide was initiated during a period of exceptionally high rainfall (3.89 inches in 24 hours) and was probably triggered by active pore-water pressure development due to leakage of surface water into tension cracks developed at the outer edge of the tram. Unsubstantiated reports state that such tension cracks existed in the tram above the point of failure prior to the landslide."*

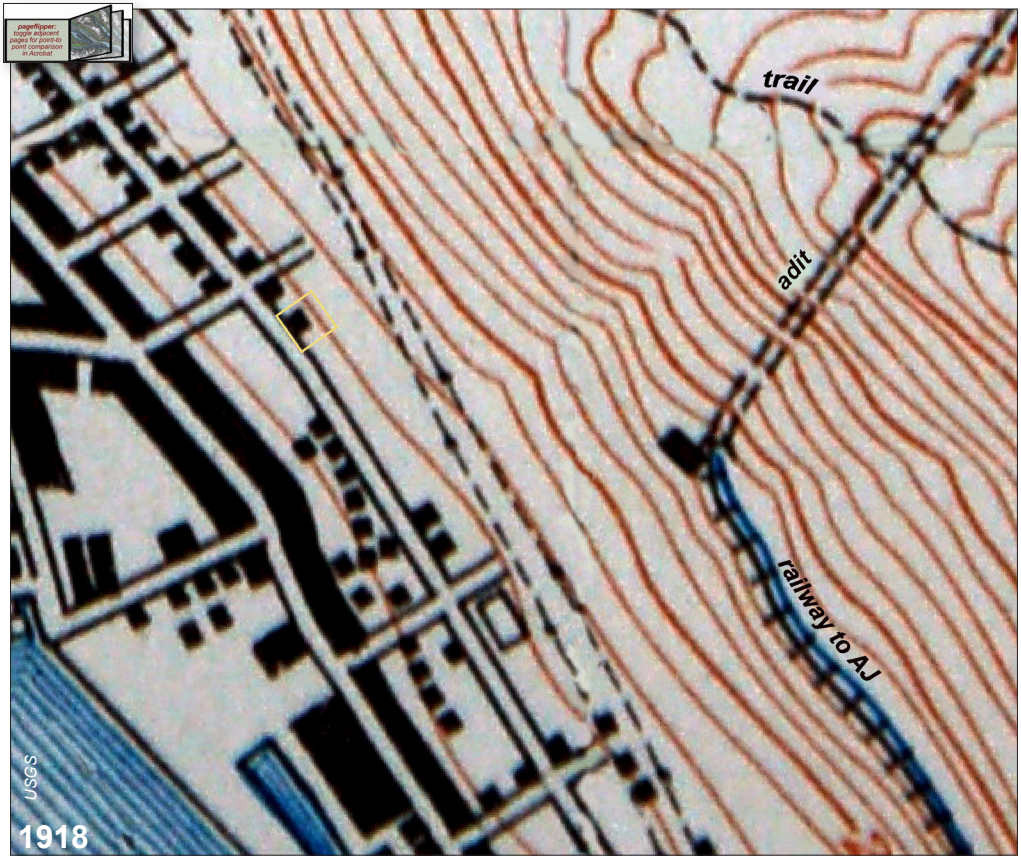
Doug gave no source for these reports. It reminds me that Di Johnson told Dale Gosnell she'd noticed a spreading crack outside Perseverance trail in summer 2021, prior to the January 21st, 2022 landslide that ran all the way down to Basin Roads-end parking and nearly took out the whole trail. I guess we need to take these tension-crack observations more seriously.

As for the lubricating rainfall, 4 inches in 24 preceding hours is a little more than we got leading into the 20220926 landslide. But we did probably receive that much in the preceeding 48 hours.

1918 topographic map

2nd of 6 pageflippers This map—104 years old—shows the year of a nearby RD Miller debris flow. Of course, we don't have an air photo that early, to look for evidence. However, on the following 1926 & 29 images, 8-&-11 years later, there was nothing unusual showing where path-3 met Gastineau Avenue, or slightly NW, where the 1918 flow presumably crossed.

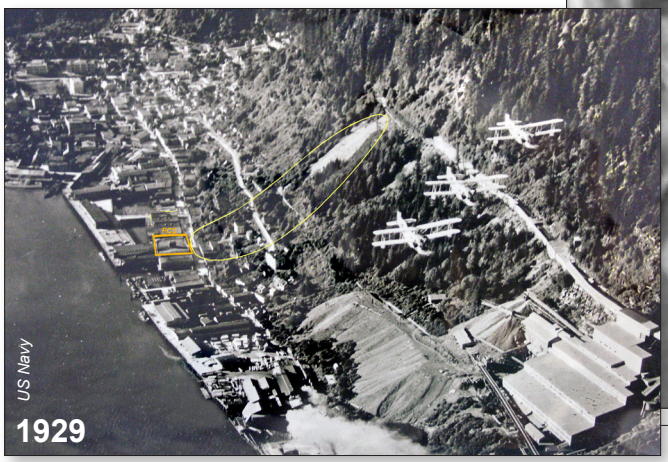
According to this map, a building foundation should be present at the adit entry. Toggling back shows this to be in path-7, so maybe landslides have since resurfaced and buried any mine-era remains.



1926 Navy aerial

3rd of 6 pageflippers Flightlines for the better known 1929 mission were inconveniently placed for cartographic-quality projection over downtown, and the Gastineau-Ave slide zone was grossly warped. Fortunately, the Navy's trial mission in 1926 provided more close-to-nadir images. Stereo for 1926 and also 1962 can be viewed in *Appendix 3*.

My yellow oval was placed here for transfer to preceding hillshade. Unvegetated opening spanned 1.4 acres. It also showed well on the 1929 oblique below, where orange PCS outline shows Public Cold Storage (compare boxy roof-tower on previous ground photo), not yet built on 1926 nadir image. By 1962, next page, fill (or continuous wharf platform?) extended out to today's edge, but in the '20s, maybe smaller boats could slip inside to deliver straight up to cold storage. Buildings in my yellow oval below were destroyed 7 years after the photo was taken.



1962 Forest Service "resource imagery"

4th of 6 pageflippers In the 1960s, USFS began flying higher-resolution, low elevation B&W surveys over its best timberlands, emulating protocols pioneered by southern timber mills targeting mostly Tàan, *sea lion* (Prince of Wales Island), thus transfering survey costs to the public. Thankfully for our current questions, what the agency called "resource imagery" included not only commercial timber but some towns and developed areas. [1]

The open portion of the still-active slide path that remained largely unvegetated in 1962 had shrunk to half its 1926 extent, now 0.6 acres. I've roughly outlined extent of the fatal 1936 slide. If correct, that means folks had already started to road and build on the debris lobe.

1 I've acquired fairly complete digital collections of early missions by timber corps such as KPC, along with the subsequent federal surveys. Especially in stereo, they provide an extremely valuable 'before' glimpse into highly productive forests long since liquidated. The collection offers a wonderful opportunity to analyze relationship of original forest structure to alluvial and colluvial fans and floodplains, and to karst. LiDAR bare earth now allows us to map these landforms in much better detail. For examples see my slideshow on stream rehab work at Sdéini Héeni, *man's name river* (Staney Creek).

1984 Forest Service "resource imagery"

5th of 6 pageflippers As with all of the previous images, I've had to georeference, with variable accuracy. This induces some pic-to-pic discrepancies, especially on steeper slopes where low-elevation cameras struggle. This is especially apparent watching disturbance recovery inside 1962's yellow oval as you toggle against this one.

Chuck Keen's clearing at top was to have been a waystation for cablecar to Shaa Tlaax summit; the "midpoint tower". His permit application never went through. Aaron remembers this clearcut from his childhood explorations.

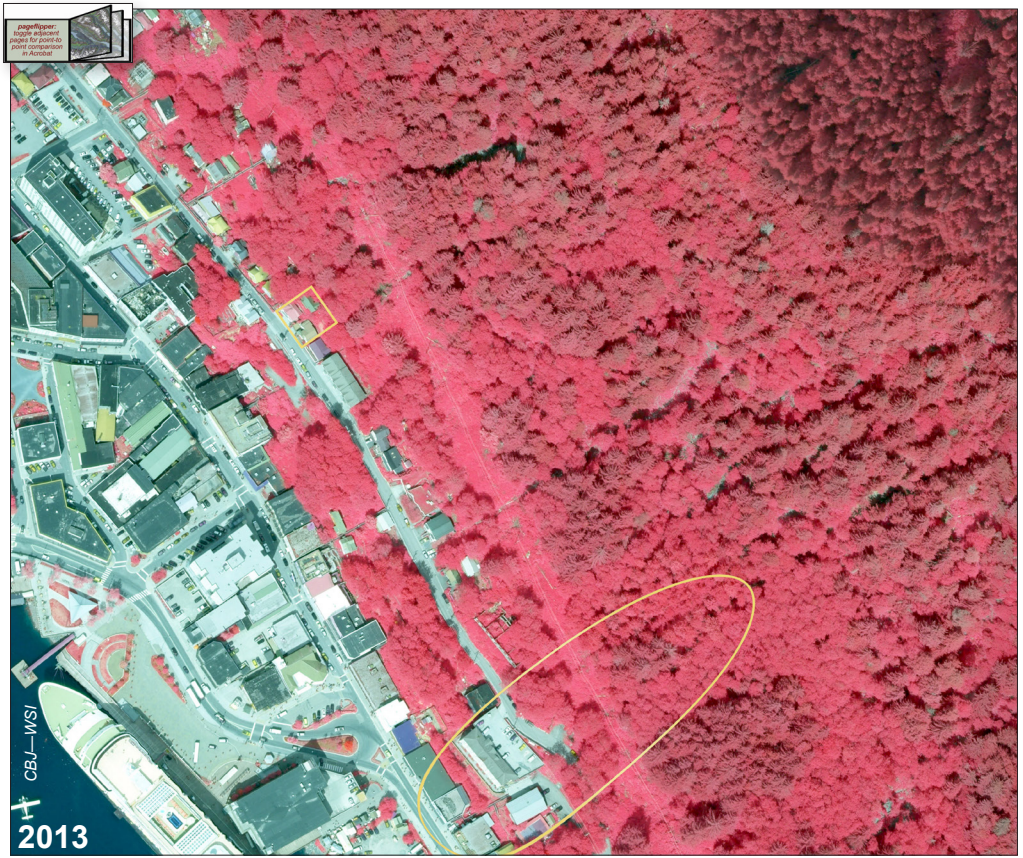
The shrinking slide path opening of previous two photos had greened over by 1984. Colors and expanding canopies now help distinguish conifers—mostly spruce—from paler green deciduous trees and shrubs.

Public Cold Storage in bottom center was where the 1936 rockslide stopped. I remember it from my early days in Juneau, but it was dismantled sometime after this photo. Toggling to next, 2013 ortho, watch it replaced by an open lot, just SW of today's downtown parking and library. Maybe it's best not to admire the Peratrovich mural at close range on days with >4 inches precip in the preceding 48 hours.

2013 CBJ orthos

Last of 6 pageflippers Color infrared (CIR) is better than true color for distinguishing conifer from deciduous. Spruces are darker brick red, and alders—largely reds here I think—are brighter pink. You can also make out the starry radiating branch patterns of spruces, in contrast to the rounder hemlocks in upper right. Weird change in apparent tree lean is due to a seam in the orthomosaic. Flightlines were very low, and 'drunken-tree' forest patchwork was apparently acceptible to vendors and clients. Fortunately, access to their exquisite, raw tifs (at nearly a gigabyte each) allows me to assemble cleaner, less inebriated exports including stereopairs. In *Appendix 3*, I've roughly overlaid these polygons in an attempt to better understand landforms and forest structure, and maybe even locate the crown of our flying tree.

AELP maintains the powerline corridor just upslope from Gastineau Ave, that turned such a weird shade of magenta on these CIRs. These lines survived the 20220926 landslide which passed well beneath them without taking out any poles. Most active and open slidepath on this orthophoto was the deeply shadowed chute near top. Hold your cursor here and toggle back to the flipper-1-of-6 hillshade. Appears to be the southeast edge of path #2



Hi Dr. Carstensen, Tom Mattice, our Emergency Programs Manager, forwarded to me your course notes on the Gastineau Avenue landslide. They are truly excellent – thank you. I'm writing to ask if you'd give permission for us to pull some information from them for a memo to the Assembly's committee of the whole that we're preparing to summarize the event – especially the photos/graphics. We'd cite anything we pull as in the document footer. FYI, will be discussed at is next Monday, 11/7

Thanks, Robert Barr, Deputy City Manager (907) 586-5240
Robert.Barr@juneau.org ● Rorie.Watt@juneau.org

Correspondence with Gastineau Ave friends

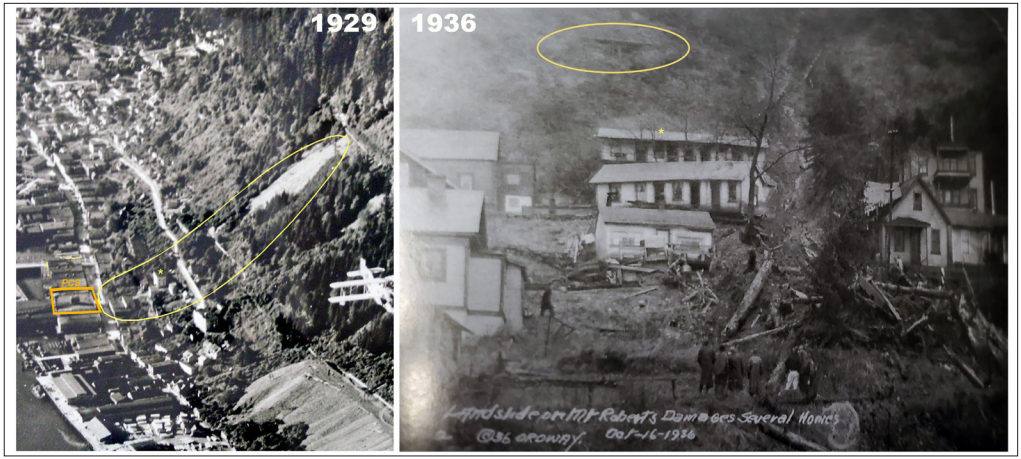
Nov 22 *Hmmmm*, fitting date to start this section—anniversary of the big one. Studying cbj's parcel layer, I've emailed folks I know who own or live along Tetra Tech's "high&severe" corridor. I won't copy the full thread here, but just some of the particularly illuminating portions.

I've started with just the neighborhood residents because of the preceding request by CBJ for an update. Not wanting to get crosswise with various insurance negotiations, I'm soliciting input before making this part of a public record. [1]

terry.schwarz@gmail.com
nancy@leightyfoundation.org
wleighty@earthlink.net
dani.evenson@alaska.gov
concathy@gmail.com
merliman@gmail.com
aaronbrakel@gmail.com
marjorie.hamburger3@gmail.com
missing emails for MJ Tenny, Jin Mitchem, Carole Triem

Nancy Waterman sent the Ordway photo on right, published by Juneau Empire in *Juneau recaptured: A personal look at the history of Alaska's capital city*. by Matthew Wilkinson and Emily Russo Miller (2017). Maybe Jim Simard can find us a high-res original. Many Ordway photos are in public collections. Here was my reply (mistaken, turned out):

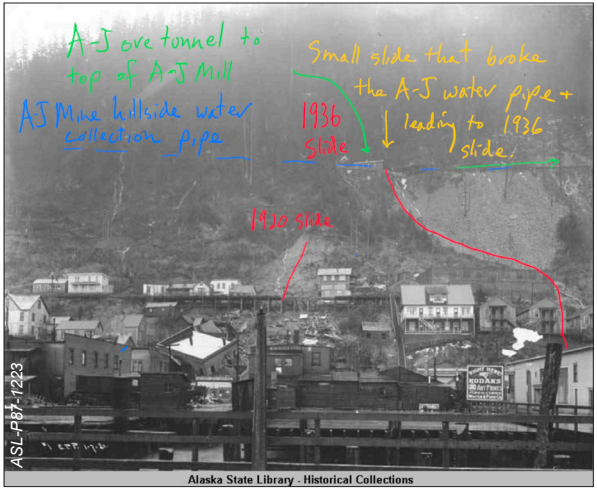
> *Nancy, Wow, cool photo. [in my annotation,] at top I circled a remnant of the old AJ-to-adit flume or railway. That didn't extend northwest to what i've labeled path-3, the 'flying-tree' chute. ● on left, i added a crop from the Navy's 1929 oblique, and dropped a tiny asterisk on what was probably the buried boarding house.. ● Looks to me like the Ordway shot is actually path-8. ● . if so, remarkable that we have a view taken only a month before the november 22 big one.*

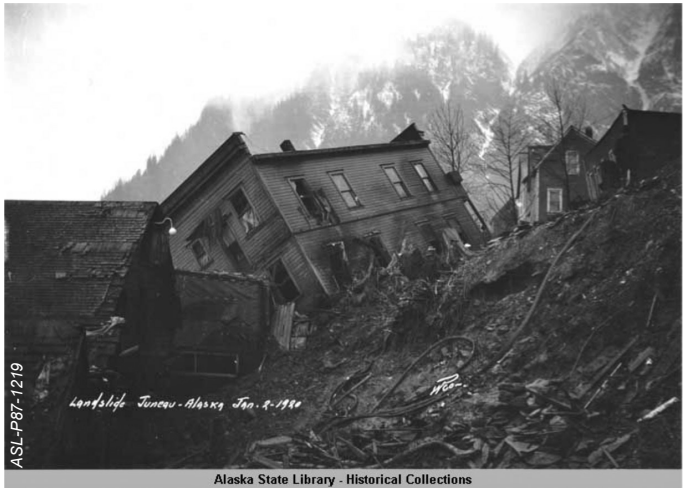


Nancy stuck by her original interpretation and sent another photo taken 1942 from the Empire book to back it up:

> ***NW to RC et al:*** *I just took one more look at a photo on page 63 of the same Juneau Recaptured book. Photo caption reads: "View of Juneau easterly from the Subport Building. C. 1942. Photo courtesy of J. Taylor." This photo confirms that the Oct 16, 1936 slide was in the same chute as the Sept 26, 2022 'flying tree' event. See the buildings and the up-hill infrastructure you had circled in the Oroway photo, Oct 16, 1936. Thanks for sharing your amazing knowledge with our Gastineau neighborhood! Nancy*
>
> ***RC to NW et al:*** *ah, i see! Thanks for this correction. I will rewrite a number of things accordingly, and send you all an update. It shows I'm wrong that Miller's 1918 debris flow was the one that just ran. And confirms that this isn't the first time path-3 has delivered trees all the way to Gastineau Ave. As you say, fall, 1936 must've been pretty soggy!*

1 Scanning back through Claire Stremple's articles, found a piece I'd missed on the financial implications of natural hazards.





Aaron Brakel sent the annotated photo above:

> ***AB to all:*** *Looks like January 7, 1920. Here's the Vilda link.*
>
> *https://vilda.alaska.edu/digital/collection/cdmg21/id/1483/*
>
> *FYI, here is the Twitter thread from early 2021 that started with David Reamer posting images of the 1920 slide.*

I've copied that thread here and added ASL's associated W&P photo 1219:

> *David Reamer@ANC_Historian ● Jan 2, 2021 ● #OnThisDay 1920, Juneau landslide kills 4 & seriously injures as many as 12. Worst landslide in Juneau history until topped by 1936 disaster that killed 15. ● #alaskahistory #juneauhistory #OTD #tdih ● @junolocal@mstdn.social ● Jan 2, 2021 ●* **JL to DR**: *David, there's some interesting history behind the 1936 slide in that it was triggered by damage to the A-J Mill hillside water collection pipe. The water was collected all above Gastineau and ran to the top of the mill for use as process water. A small slide from above broke the pipe, and the water from the pipe saturated the hillside which soon collapsed and flowed across Gastineau, and eventually across South Franklin, carrying the buildings and people with it. I chanced across the details while looking through the a box in the AEL&P/A-J Mine collection at the Alaska Historical Library in Juneau. The A-J legal team documents and correspondence with San Francisco office were interesting to say the least.* **DR to JL**: *Excellent! Thank you! I especially appreciate the detail on the 36 slide. I also miss digging through archive boxes.*