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Landstand: An Archive for Mass Rephotography

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This journal has long interested itself in historiography and more recently in images; herewith follows some historiography about imagery. About ground photos. My topic is mass rephotography, and my thesis is that the United States should and still could piece our past landscape by building a real ground-photo archive.

Retrospects: Three Funerals and an Adoption

I am a retired history professor, and this archive is a task that my generation never got done. So toward that goal, as a triage beacon and phylogeny-recap and Programmer's Aid to the next generation, here is my trip report from rephotography. I promise more specs than bile.¹

¹ "ROM Software Library for Apple II," *InfoWorld*, 14 March 1979, 6.

WhereintheHills

I am not a photographer; I just strayed into photos by researching landscape, which it turns out is the visible form of land. I first wandered in while writing history articles at a remote-sensing shop in the U.S. Geological Survey. One way of referencing imagery there was by where it was taken: satellite imagery, aerial photography and, much less often, ground photography. So I used all of these to help explain and inform each other without thinking much about it. A bit later I began a dissertation on the landscape of the Black Hills forest, and scrounging for sources I inevitably tried ground photos again. I wondered at whether I would find any, and then I marveled at how many I found and how useful they were, but how scattered and disorganized and difficult they were to get. So I started gathering them more avidly and thinking about them more explicitly.²

Ground photos-- photographs of the landscape taken from near the ground-- inform forest and environmental history in important and obvious ways. They are plentiful, legible, durable, global, longitudinal (extending in one format to the mid-1800s), and they're cheap. They are all but universal, reaching all across environmental history, other academic disciplines, and popular culture. People use ground photos to communicate across these borders to people very different from them, and people pull information from ground photos that were shot for purposes very different from theirs. (Many of mine are from geologists, and I don't know schist from gneiss.) They reach very high resolution, which tends to rehumanize and respeciate the world seen through the GIS windshield. They help to illustrate and calibrate satellite data. They are one more way of getting under the canopy, and they show vertical phenomena like caves, bark, stratigraphy, streambanks and signs. They are in fact the last (or maybe the first) and native resolution of remote sensing. There's a kind of Turing test for a ground photo database:

² Robert Wellman Campbell, ed., *Earthshots: Satellite Images of Environmental Change* (eight editions 1997-2008 at usgs.gov).

if the computer said we have photos of your study area, would you look? But it's a boring Turing test because there's no suspense; you'd look. They're great sources.

And, they improve with repetition. Rephotography, sometimes called repeat photography, is the practice of placing your camera where someone placed theirs, to make before-and-after photo sets. It is often the only way to prove the location of the original photo, it helps to calibrate or reconcile that document to reality, it's something real and reliable that students can do, and it's fun. Done well it's like time travel.

People have been doing rephotography for a very long time. The standard chronology starts in the 1880s with the euonymous Sebastian Finsterwalder, and swells in the 1950s along with landscape studies generally. In fact the surprise here is the lag between the invention of photography and rephotography, because rephotos flow naturally from photos, like alcohol from apples or babies from a Blue Lagoon. People are already curious about landscapes they love, and they don't need the idea of then-and-now shots explained to them (the Beatles didn't return to that balcony because they were up on their Finsterwalder), so what's needed to produce rephotos in mass is to distribute originals in mass. Millions will get you your thousands and billions your ten thousands.³

But now we've arrived at the crux, at the kink in the hose: rephotography languishes in prototype mode, largely because the archiving and distribution of ground photos languishes in amateur hour. (Saying "and distribution" is an insult to archivists properly obsessed with distribution, but unfortunately one still sees the Roach Motel model: documents check in but

³ Robert H. Webb et al., *Repeat Photography: Methods and Applications in the Natural Sciences* (Washington, D.C.: Island Press, 2010), 3-11 sketches the chronology. This Tucson group, spanning generations since the 1950s, is probably the U.S. model for serious rephotography. Henry De Vere Stacpoole, *The Blue Lagoon* (London: T. Fisher Unwin, 1908). The Beatles, *1962-1966* and *1967-1970* (London: Apple Records, 1973).

they don't check out.) We're now measuring this activity in centuries, yet you can still see people getting chesty about a few dozen shots they've redone. This preciousness gets little work done, it offends my American Fordism, and it disarchives documents by never having shot them. TLDR: too late; didn't rephotograph. Mass rephotography-- let me repeat my Catoian mantra: mass rephotography-- shouldn't be some distant millennialist dream like Chinese democracy or even *Chinese Democracy*; it's easy; we're just constipated.⁴

So there I was with my couple-thousand photos and my wonder at the system. Ground photos reached back to the 1840s, but you had to travel back to the 1840s to use them. I had never searched books or maps or satellite images or census data by calling around and rummaging through boxes, but there I was for photos in the Forest Service garage. (Thank you, Blaine Cook.) They were a bit like manuscripts but not; they often had little text and unknown authors, they were often mass-produced and popularly used, and above all it was so obvious how to arrange them: by where they were shot. These documents belong on a digital map, but they resided in archives that were barely digital and certainly not spatial.

So, the end of this degree of my education: I thought I should at least not add to the stink, and I got some money to make a website for my little collection, dressed up as an invitation to rephotograph it. I posted my little WhereintheHills.com, let anyone have the photos, had a moment of satisfaction seeing them arrayed in Google Earth (they twinkle), and immediately realized that this was just more problem, not solution. One more pile, puny and ephemeral, was just more digital amateur hour. I left it up but put away such childish things. I made useless the things of the babe. This was 2004.

⁴ Guns N' Roses, *Chinese Democracy* (Geffen Records, 2008), was already "long-awaited" and expected soon by November 1999. Richard Cromelin, "Pop Eye," *Los Angeles Times* 7 Nov. 1999, 90.

Landstand

It took me time to grasp the obvious, that the place for a serious ground-photo archive was USGS. That may be just my bias, but probably not. When you zoom out to the scale of millions and decades almost all of the candidates drop out. EROS, the USGS remote-sensing center, boasts “the largest civilian collection of images of the Earth’s land surface in existence,” with tens of millions of images from satellites and millions more from other platforms reaching back to the 1930s. They are stable, archiving as one organization at one site for almost half a century, so many of their collections have already transitioned through generations of media as they’ve scaled up from megabytes to petabytes. And as one zooms out to hundreds of millions of Americans, USGS enjoys significant familiarity and credibility, as geodata go, if only for the topo maps and earthquakes. EROS scenes go out to the public by the millions, in the public domain and generally as free downloads.⁵

But those are scenes from satellites and planes. I had come to see ground photos through the remote sensing / GIS lens, but I more-than-suspected that the RS/GIS folks who could really apply those skills saw ground photos as being out on their periphery or beyond. It’s easy to see this as a case of “some have bread and cannot eat; some can eat but have none,” with history archives holding the photos and landcover archives holding the tools to handle them. But in fact there are broad overlaps. Satellite metaphors like footprints, swaths, and mosaics translate right onto the ground. Remote-sensing organizations like USGS hold large numbers of ground photos, plus more from other near-ground platforms that are similarly selective, oblique and high-

⁵ Quote: usgs.gov/centers/eros, accessed 18 May 2020.

resolution. And the humanities have skills in handling data-- and the real job, metadata-- that have far more human mess and complexity than a typical closed satellite system.

But these overlaps seemed like two halves of a hinge with no pin. So I decided to take a stab at some public-sector entrepreneurship, and I contrived a return to EROS for a couple of summers of thumping the tub. Interjecting here, if you think it's easy getting the federal government to take on a new and indefinite task, then you go right ahead. Some people asked me how realistic the chances were; I remember saying they were near one if trying it from inside the building, near zero if not. I took my time and talked with many people, one on one, making my little pitch and thinking about every comment and question. I had novelty on my side, plus the politeness shown to a former colleague and current guest from another institution. But above all I had frugality; funding jumps by orders of magnitude from humanities to science to medicine to defense (NEH : NSF : NIH : DoD :: 1 : 10), so their crumbs are our loaves. To be the only historian in a science center is to be Clarence Oddbody in *It's a Wonderful Life*; people are gracious and respectful but see you as something quaint and ethereal with old-fashioned underwear. Eventually someone says, "Hey, little fellow, you worry me-- you got any money?" Having an office on the boss's hallway helped; one day a nice vice-somebody suggested some leftovers from some project-slice but apologized that she only had about \$75K. I laughed and told her thank you, and that not long before I had been turned down for seven.⁶

At the end of two summers, as classes approached, I drove out to pitch the new boss, early on a Friday morning. I ground my well-ground organ, answered a few questions, and

⁶ A logarithmic graph of the numbers reported on the websites of these agencies (the National Endowment for the Humanities, National Science Foundation, National Institutes of Health, and Department of Defense, using DOD's over-simplified headline number) would indeed be very linear if one added to NEH the National Endowment for the Arts. *It's a Wonderful Life* (Liberty Films, 1946).

translated the project into Boss: one FTE to coordinate ground photos, not including computer support and so forth. And I said they should call it Landstand, as in complementing Landsat from the ground. To my amazement he just said yes. “We do have a hole here-- and we can call it American Landstand,” he joked. “Can you start on Monday?” I told him I had to get back to my freshmen and family, that fiscal years end in college summers, and that I could come in June, or he could hire someone else sooner. It was an odd sense of loft. I went home and we pen-palled and he seemed a bit anxious that the project was not formalized in that impending budget and I didn’t care since it was his own budget scraps anyway. And then, a few months later, he resigned. Now who expects him to up and resign, nine months in? No scandal, nothing to do with little me of course, just gone. And seeing that news I instantly thought, it’ll never happen. Not never, because it’s inevitable, but not this effort. The fish had flopped out of the boat. That was 2008.⁷

Adopt a Pixel

And so it played out; it was three years replacing the boss, by which time the country was into recession and sequestration and fiscal cliffs, and digital cameras were no longer the discussion, and anyway it was now a twice-told tale and I had played my card. I pursued my little regional project and stopped protagonizing people.

In 2013 I heard about Adopt a Pixel, a NASA program asking students to rephotograph plots of ground to calibrate images from the newly launched Landsat 8. The NASA folks aimed at children and had connections to 4-H. A brilliantly simple concept, and I agreed or volunteered

⁷ Just say yes. *Yes Man* (Warner Bros. Pictures, 2008). Matt. 21:28-32.

to help if I could. So I was “on the grant,” and there were meetings, and there seemed to be momentum. The funding targets were an internal USGS grant and then a much larger NSF one. This felt like declining chances, but I thought Adopt a Pixel was valuable in its own right, and had a decent chance of exciting some interest in getting somewhere toward a ground photo database.

The ASEH happened to be meeting in San Francisco that year, and I thought I’d go beat some bushes in Silicon Valley. So I had some discussions: bayside coffee with the copyleft people, lobby chairs with a federal agency, a meeting and obligatory lunch at Google, and a great riley seminar at USGS in Menlo Park. These were all easy to arrange, though I got with Microsoft too late to meet.

The group I tried most was the one I didn’t get. To my amusement my only non-conferers at the environmental history conference were the environmental historians. Don Worster had once told me I should visit the Spatial History Project at Stanford as he had. I recalled the Older Grad Student caution that Don’s advice is great but comes from Don World, where people give a hoot about him, and that we do not, and do not deserve to, live in Don World. Still, as Stanford was sponsoring this conference on “digital and visual platforms,” was hosting a closed workshop on digital somethings, and was in vogue as no American university had ever been, I tried and tried for at least a letter of support. I assured them I was not trying to weasel into their workshop. No response. Elite universities are impressive exclusion factories, with annual rejection rates approaching one, but that’s just a standard like 20/20 vision, not a limit like warp ten; I hit about a hundred. One night I stretched my legs around Stanford and laughed when I saw I was at their office door; while tugging the handle I thought damn, these

guys are good. As I munched outside Stanford's great sandwich place up walked, of course, a kid from my little South Dakota mill town on his way to the GIS lab; as I sat in the lab's lobby not allowed to go in I thought damn, these guys are good.

In fact it was in the motel parking lot on the day of the secret workshop that I got the email that USGS had awarded the initial internal grant. They built a container and a clever intake portal, and EROS put its first ground-photo archive online-- a great event. But Adopt a Pixel never got that larger grant, and the collection reached a couple of thousand photos in the prototype at Flickr, plus 190 at USGS. Rephotography languishes in prototype mode, largely because the archiving and distribution of ground photos languishes in amateur hour.

Landstand

Now it's 2019; it seems that every five years I come out like some kind of data cicada, creaking for action. My own little stimulus was the completion of an online demo of linked panoramas (see articles in this Forum, "Gobstoppers" and "Centifluences"). More importantly Adopt a Pixel is still alive in NASA's GLOBE Observer program, and EROS has now posted a second ground photo database, 12,000 images from USGS's Land Cover Trends project.

Getting to two datasets side-by-side hopefully illustrates the potential of combining such streams into a larger, simpler project. Many years ago, having nothing to do with ground photos, some mid-boss at EROS said, and I'm quoting imperfectly, "Ahh, we always get some little, geography association in Michigan or something, wants to start a satellite archive and just has no, i, dea what they're getting into. They collect a few thousand images and then call us to see if we can take them off their hands." That's basically what I did; that's what everyone does; the pet

bear cub. The Forest History Society has put up an ambitiously named The Repeat Photography Project, which after about five years appears to have about 500 photo sequences. It's throwing up some red flags: the T-word, the R-word, the fact that it's only repetitions (the way to get bees is not to catch bees but to plant clover)-- but they're not so much out of their league as out of their lane. They have been very nice about it every time I ring them up, which shows me yet again that the way here is collaboration. It's a stone-soup situation; someone has the carrots, someone has the chicken, and I think I know who has a very big pot.⁸

Prospects: Eleven nontech specs

The big one's still out there in the lake; the gas pedal waits on the right. For all our talk about "tech," this is as usual an organizational problem not a technological one. A real ground-photo archive is an easily, eminently, tantalizingly doable project, and here in brief is the ingredient half of the recipe. This is what this actually consists of.

Capacity: On the order of tens of millions of images. There are lots. I have 14,000. We should declare at least a lessatorium on the micro-archives and try to collaborate. Mickey Mouse has enough brooms already.⁹

⁸ repeatphotography.org

⁹ *Fantasia* (Walt Disney Productions, 1940).

Neighth: Rhyming with its vernacular antonym *heighth*; they just have to be from any platform near the ground. So they could include low, oblique aerials from drones and airplanes not on regular flight lines.¹⁰

Catholicity: Not just the rephotography (a term I prefer for being a one-word keyword and having a swappable prefix), but all of them. Consider every photo prephotography (see?) and the repeats will follow. Besides you'll get a lot from footworn paths: tight or loose accidentals (from people who happened to shoot in the obvious places), and a few deliberate retrophotos (from people who guessed where someone had probably shot before). Of course, commissioning photographers crosses an odd taboo about historians creating primary documents, like old-fashioned museums waiting for people to walk in the doors.

Liberty: Public domain. There's no point farthing around under use restrictions, even the Creative Commons ones. In a better-functioning republic Creative Commons would stop treating public domain like some dirty Cinderella, and copyright law would have a single clock starting when the image was fixed into tangible form, and we'd do without the influences of greedy corporations, sanctimonious thieves, and bad archives contriving quasi-royalties. But till then it's the federal, the old, and the CC0.¹¹

¹⁰ The elitist conservatives at American Heritage call *heighth* obsolete; the permissive lefties at Merriam-Webster call it a "chiefly dialectal variant;" the Mormon empiricists at COCA-COHA (funded by NEH!) agree with AH and me, showing it declining 1990-2018 and 1810-2009 but still alive on the Web and TV. No slips for *neighth*. *AHD*, 1st ed., 1978. Merriam-Webster.com Dictionary, 20 May 2020. *Corpus of Contemporary American English* and *Corpus of Historical American English*, english-corpora.org, 20 May 2020.

¹¹ Creative Commons may at long last be moving; as this article is moving through editing, CC is testing various new "license choosers" that no longer segregate CC0 (their public-domain license) into its own side-room as if it were something not quite.

Euphony: It needs a good name. To almost everyone it will be a word before it's anything else.

Through the dismal years of Watergate USGS suffered a satellite with a name like robot ructus--ERTS-- till some sage Moses renamed it Landsat 1. I inherited a series called "Historical Landsat Data Comparisons," which was fine as a semi-academic book, but to go online for the millions we renamed it Earthshots. No more ERTSes! Don't be Dexys Midnight Runners. I haven't heard a better name than Landstand.¹²

Progression: Just as big websites roll their changes out in stages, these landscapes should be rolled into the database in order. The early messy ingests should be among friends in the building and then out concentrically to others in the agency, other agencies, then archives and only then the wooly public. And on the day it goes public this archive's holdings have to be big (i.e. local) and exciting enough to get some excitement, because you only get to be new once. For example I can't release a Black Hills collection until I have Custer's photos, because no one gives a doo about a collection without Custer's photos. Don't be Dexys Midnight Runners and not play "Come On Eileen." If you do they won't look a fourth time.¹³

Reciprocity: It's not taking photos from donors, but referring users and credit to participants.

Though, in all normal circumstances, no takebacks (see: public domain).

¹² Numbers 13:16b. Matthew D. Cross, "Historical Landsat Data Comparisons: Illustrations of Land Surface Change" (Sioux Falls, S.D.: U.S. Geological Survey, EROS Data Center, 1993). EROS Data Center, "Historical Landsat Data Comparisons: Illustrations of the Earth's Changing Surface (Sioux Falls, S.D.: U.S. Geological Survey, EROS Data Center, 1995).

¹³ Dexys Midnight Runners and the Emerald Express, "Come On Eileen" (Mercury Records, 1982).

Internability: Scalability will come down to this: uploading your organization's photos into the database has to be easy enough that you'd delegate it to your summer intern. At the firm we'd say it's paralegale.

Sites: You should probably "snap" each photo, in the Photoshop sense, to the nearest defined spot that is close enough; otherwise you'd get an unworkable splintering of imperfectly placed rephotographs. The points' cloudiness would only represent meaningless imprecision. But how close? Rather than setting a snap radius of x feet, I would ask a couple of practical questions: Were they apparently attempting a rephotograph? And can you register (i.e. align to stack) the images? You can have sites without keeping a list of sites, by just linking photos to photos. A site is defined by the first photo shot there, so every rephoto can just have a target photo as its site.¹⁴

Metadata: Ground photo metadata are messier than aerial and satellite metadata. One useful step would be to bring back photos' backsides (apparently mislaid by the JPEG group in the 1980s), where a lot of metadata live. Still and moving pictures have been blending more lately, and historical photos should be multiple-page, including multiple backsides for the metadata. For location metadata I use three resolutions: nameplaced (itself multiresolution), estimated (on-screen, from metadata or virtual rephotography), and verified (normally by rephotography). All

¹⁴ Of course in most records the "Rephotograph of: (target image)" field will be blank. Likewise for "Backside of: (obverse image)," "Extension of: (center tile), and "Duplicate of: (best obverse version)." When querying you could say, in effect: skip all side-tiles, duplicates and backsides. All of these would add to the point cloud. See the article "Gobstoppers" in the accompanying multimedia.

of these can be crowdsourced in ways that benefit from users' knowledge without necessarily letting them into the cockpit.

Basemap: GNIS over AAA. Satellite systems typically locate scenes by grids of “rows” along flight paths; the ground-photo analog is sites around GNIS points. The Geographic Names Information System is two million federally-recognized place names, stable and located and ready for nameplacing. The “ground” under these “figures” can be various satellite or aerial imagery, but will often end up being the earliest layer of U.S. aerial photography, the New Deal imagery from the late 1930s, basically for the Agricultural Adjustment Administration. I expect many people would be surprised that we’ve never digitized these invaluable documents.

Eventually when a scientist came to me about imagery I would say: “Let me guess: you want the earliest imagery of your study site. It’s from 1938 and it will take some doing.” It’s shameful that most of these images are lying around in drawers getting lost and thumbed rather than available at our digital tips, because this too is not hard. A dysfunctional, Trumpian country we’ve been in for decades, a wasteful Gilded Age, an aristocratic Ancien Régime.

The backside

There's an old joke about a traveling preacher having only one sermon because Jesus had only one gospel. I haven't achieved such focus, but some of mine do cluster. Diarrhea and constipation run together, in the body politic as well as the gut, and in the case of spatial data related to forest and environmental history, so far outside historians' comfort zone of the verbal and ideological, we often see information constipation even amid the datarrhea. Those 1930s

aerials and their death by repeated piecemeal scans. The likelihood that we all, or at least forest historians, should drop everything and rush into dendrochronology like bystanders at a burning archive, which it what it is. And the ground photos, pop pop pop turning to lost landscapes, unlinked and unlocatable, while they lie in their drawers, or even in their digital folders.

I don't think the fault is especially on me, or on any one I can point to, but it feels like a frozen cultural climate in which things don't move. Landstand, like most affairs shy of Jerusalem, just circles back to democracy. This should be one more democratic institution running warm in an open society, but it can't even crack the egg. And we should be alarmed. We should be alarmed that it took longer to put up Landsat 8 than Landsat 1. We should be alarmed that employment takes longer to recover each recession. We should be alarmed that we need to do hard things like decarbonization but we can't put some JPEGs up on the web. The web that hasn't improved in a decade. We should be alarmed that Washington is apparently just a lymph node of our cellular dysfunction.¹⁵

So, hard bad times. But my old department chair always insisted that we keep a proposal in the drawer in case the money ever called. To me it feels like shifting up without a clutch: nudge, nudge, nudge, waiting for the synchro.

¹⁵ Catherine Rampell, "Comparing Recessions: Job Recovery," *New York Times* Economix blog, economix.blogs.nytimes.com, October 8, 2010. A chart showed employment dips and how many months each took to recover their pre-drop number of nonfarm payrolls: for the 1980, 1981, 1990, 2001, and 2007 recessions, about 9, 26, 31, 47, and much more than 47 months. Even more alarming was how placidly people noted this fire bell in the night, on the blog and in the society generally.