

# A brief history of topographic mapping

copper, mylar, lidar

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WA GIS

May 20, 2026

Elaine Guidero

# About me

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- Washington, Oregon, Idaho, Montana, Wyoming, North & South Dakota
- Denver, CO
- French Lit BA...Geography Ph.D.
- Dad jokes



# Acknowledgements

Maria McCormick, USGS

Jim Reed, RockWare

Wayne Kemp, RockWare

USGS Image Gallery

USGS TopoView (HTMC)

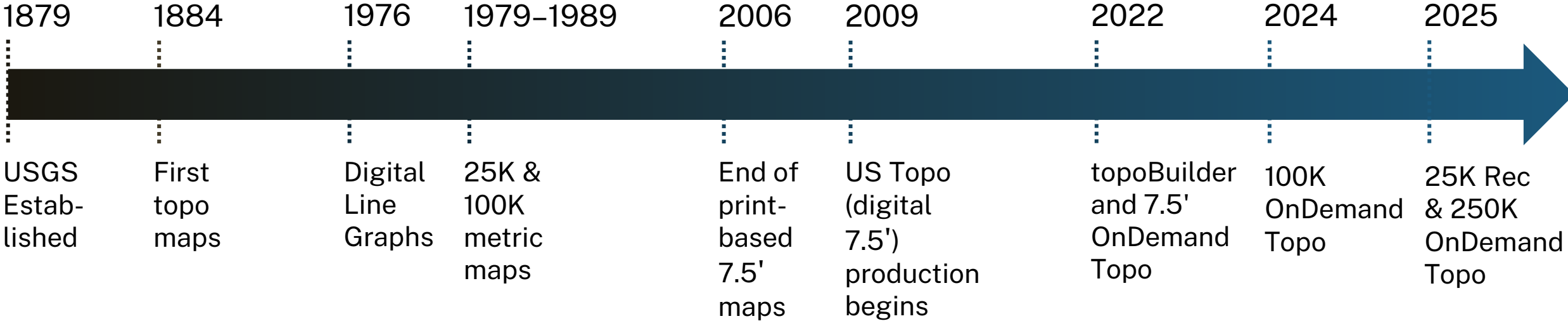


<https://ngmdb.usgs.gov/topoview/>

not to scale

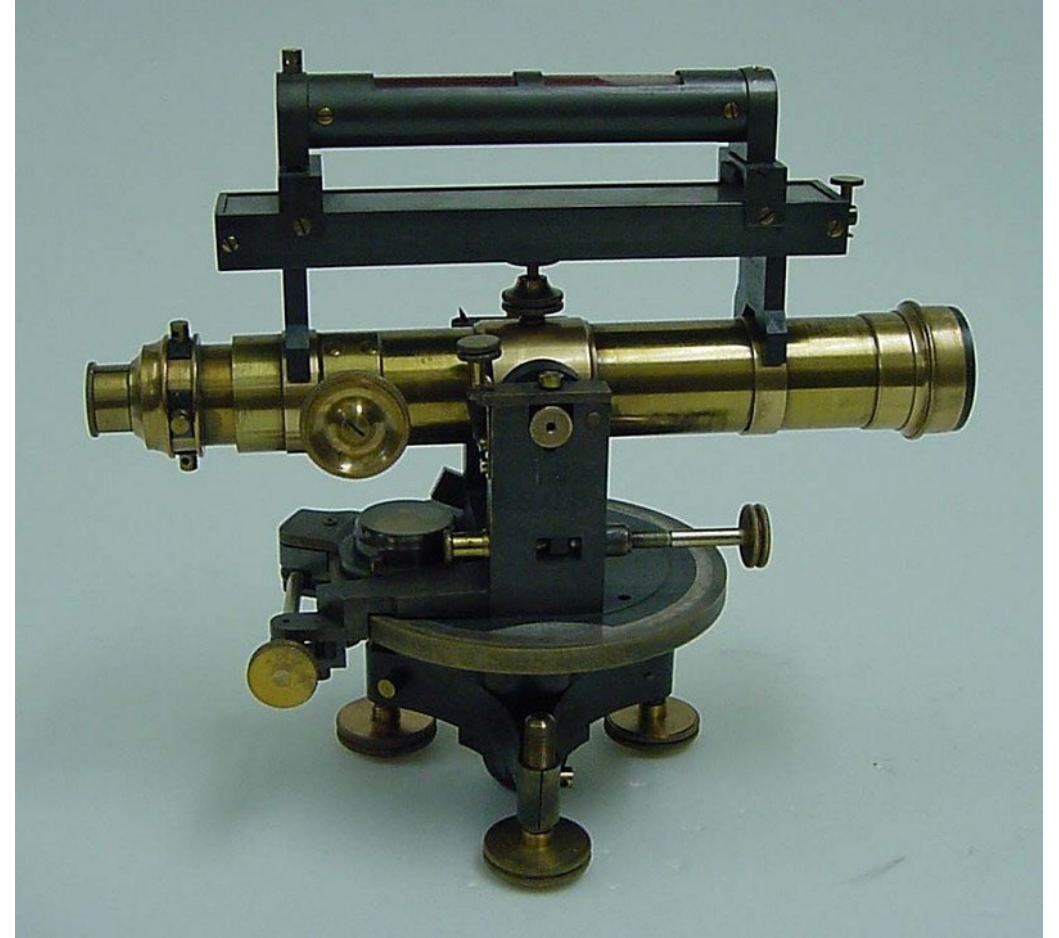
# Timeline

topographic map production at USGS



# Early tools

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Museum of  
American History

# Early tools

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Museum of  
American History



Museum of  
American History

## 16. Entertaining Persons in Camp.

1. Heads of parties and all other employees of the Survey are cautioned, when on field duty, against entertaining in camp any persons, whether acquaintances, friends, or relatives, in a manner to interfere with public business.

2. It sometimes happens that objection is made to entry upon private property by employees engaged in official work, but it is believed that generally this objection may be overcome by an explanation of the public character of the work.

Show wood lines and areas by crinkled line, thus:



### INSTRUCTIONS

RELATING TO THE WORK  
OF THE

UNITED STATES GEOLOGICAL SURVEY

TO TAKE EFFECT

MAY 1, 1903



# Printing techniques & styles

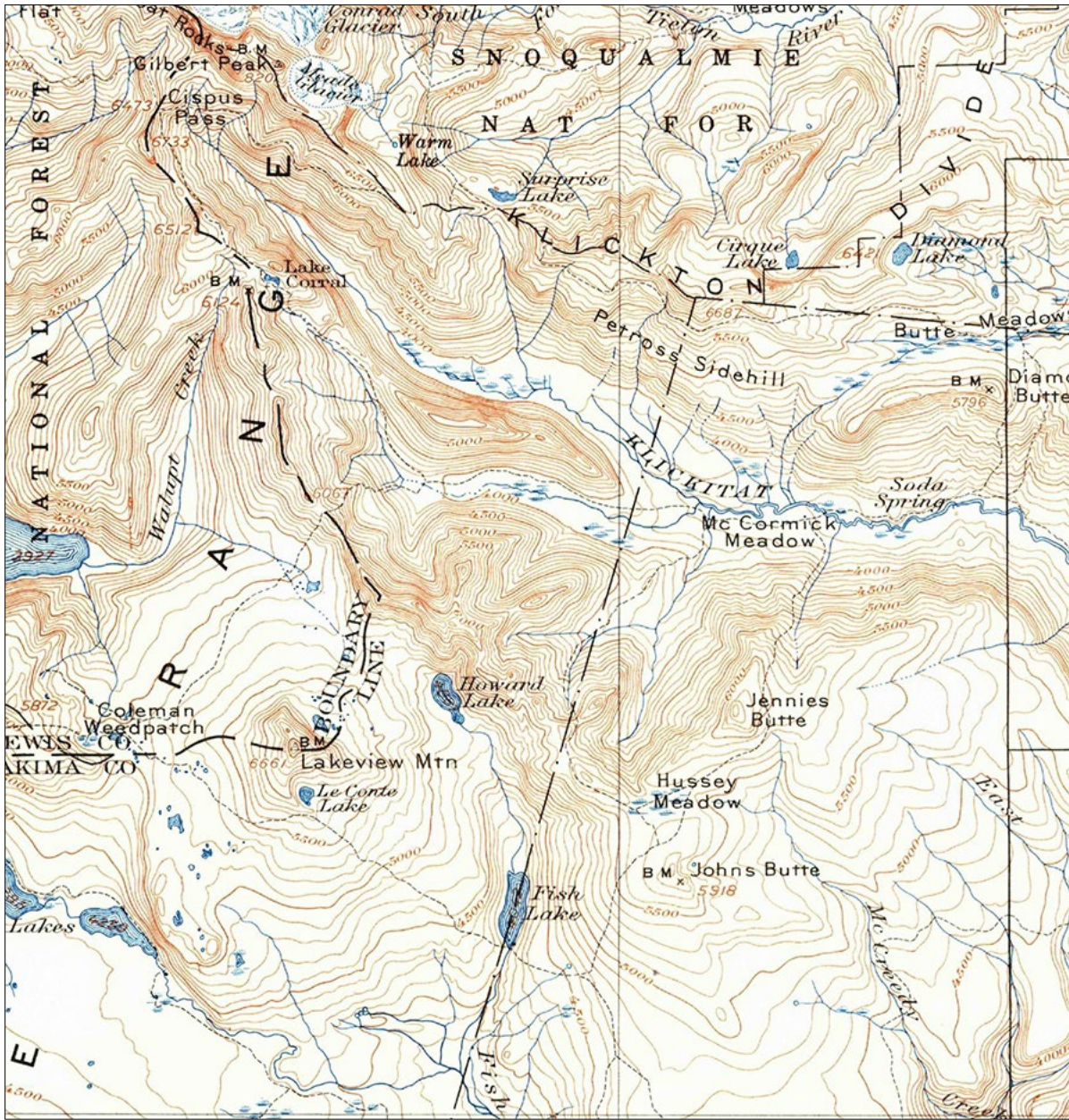
# Copper engraved 3-color litho

1884-1940s

Bath, Maine (1894)  
1:62,500



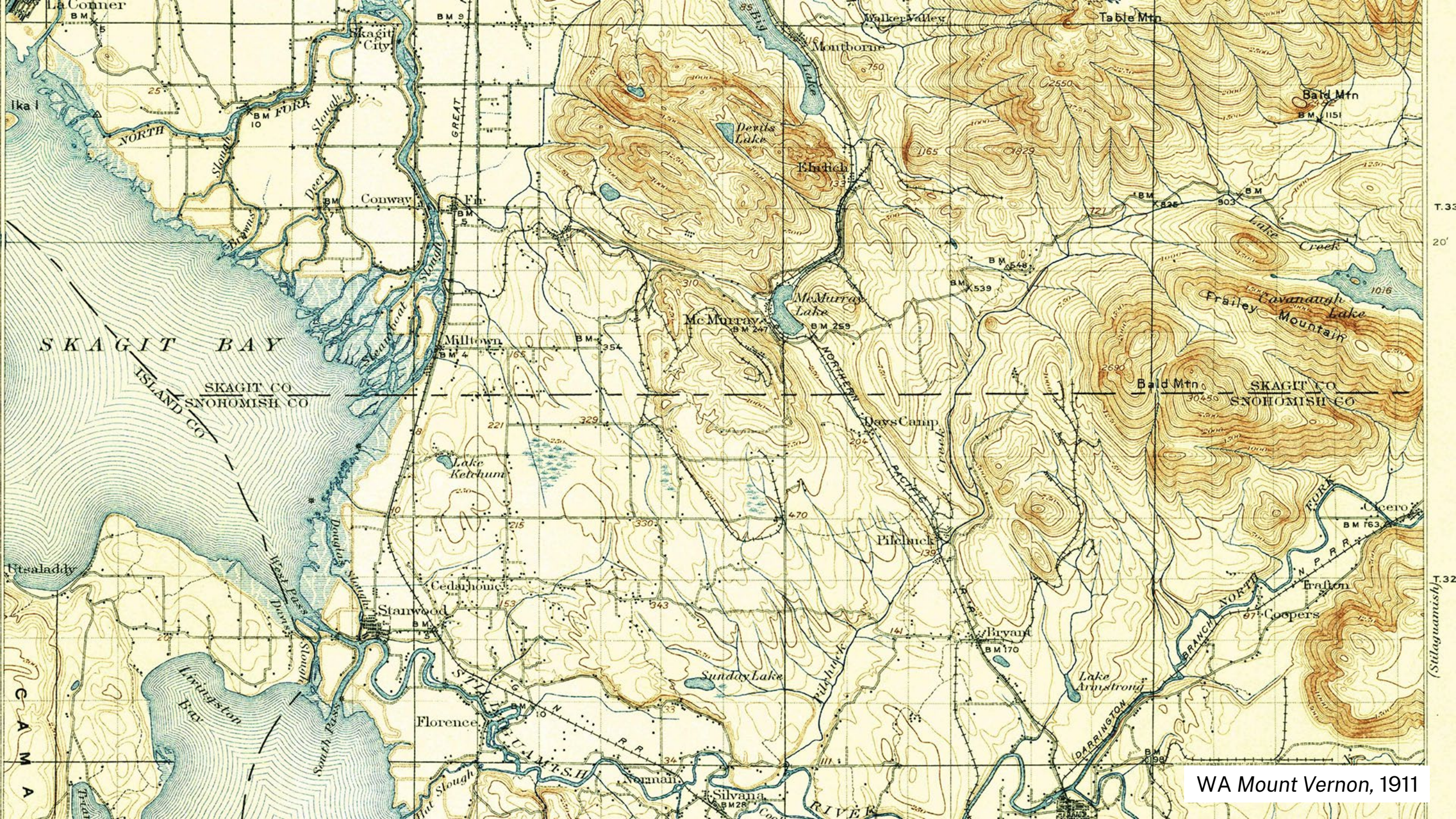




WA Mount Adams, 1904



OR Ashland, 1897

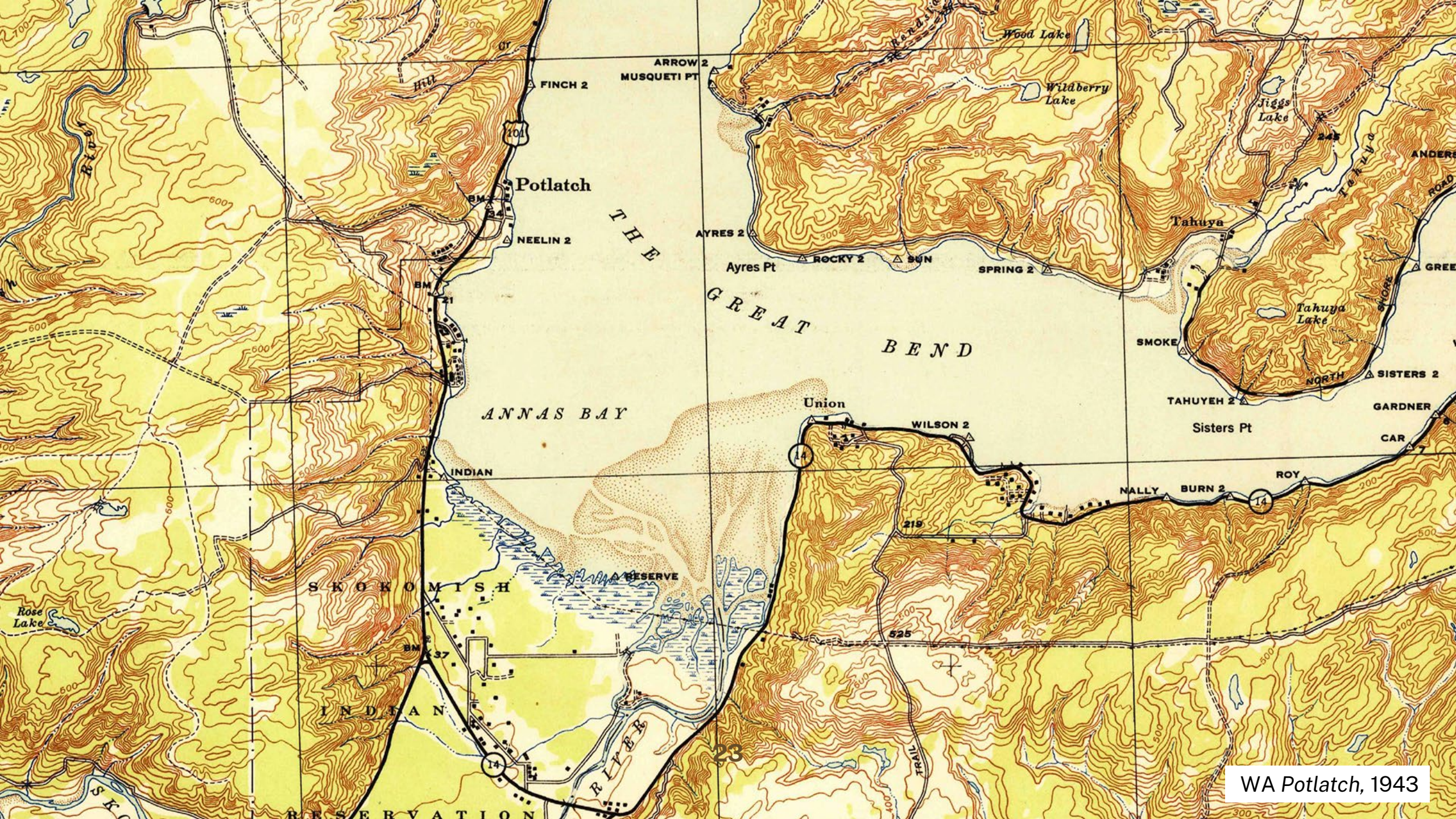


SKAGIT BAY

SKAGIT CO  
SNOHOMISH CO

SKAGIT CO  
SNOHOMISH CO

WA Mount Vernon, 1911



ANNAS BAY

THE GREAT BEND

SKOKOMISH

INDIAN

RESERVATION

Potlatch

Union

Tahuya

Tahuya Lake

Sisters Pt

WA Potlatch, 1943

MUSQUETI PT

FINCH 2

AYRES 2

Ayres Pt

ROCKY 2

SUN

SPRING 2

WILSON 2

NALLY BURN 2

ROY

GARDNER

CAR

SISTERS 2

TAHUYEH 2

SMOKE

ANDERSON

ROAD

GREEN

Jiggs Lake

Wildberry Lake

Wood Lake

Rose Lake

Hill

INDIAN

RESERVE

INDIAN

RIVER

TRAIL

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# Mylar scribed 5-color litho

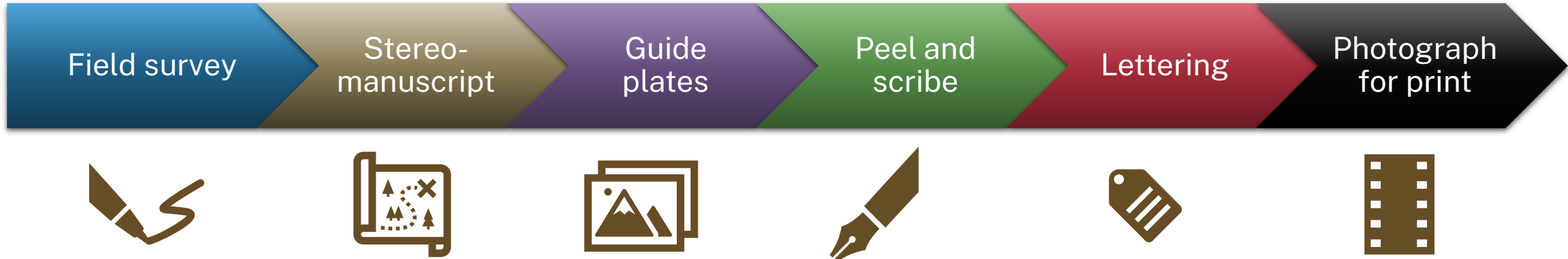
1940s–2006

Bath, Maine (1957)  
1:62,500



# Mapping process

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# Stereoscopic modeling

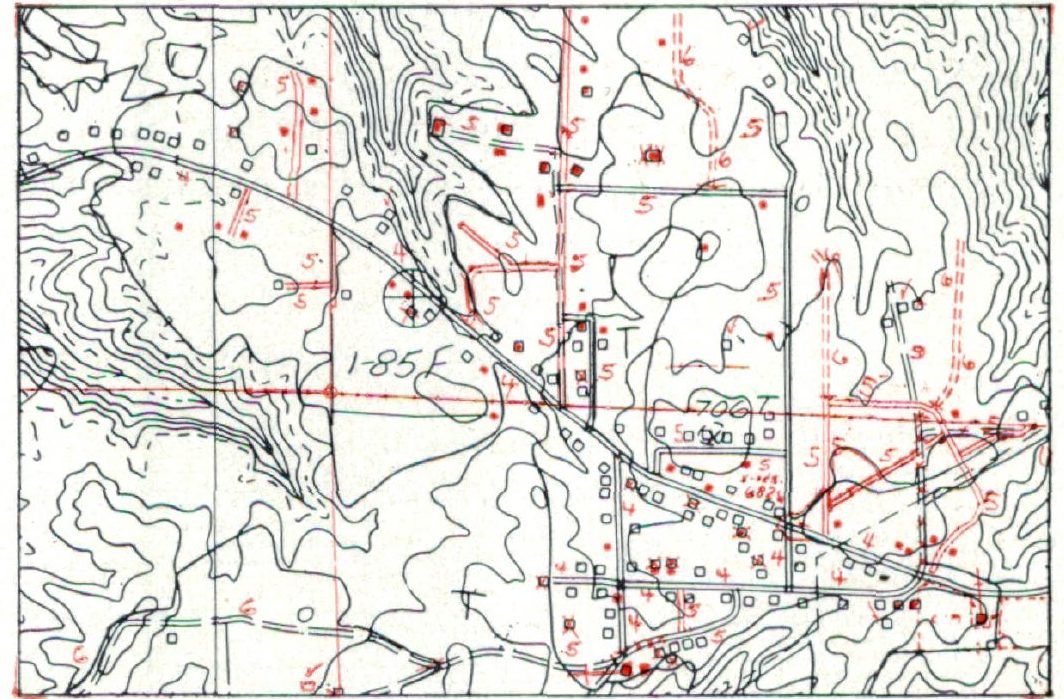
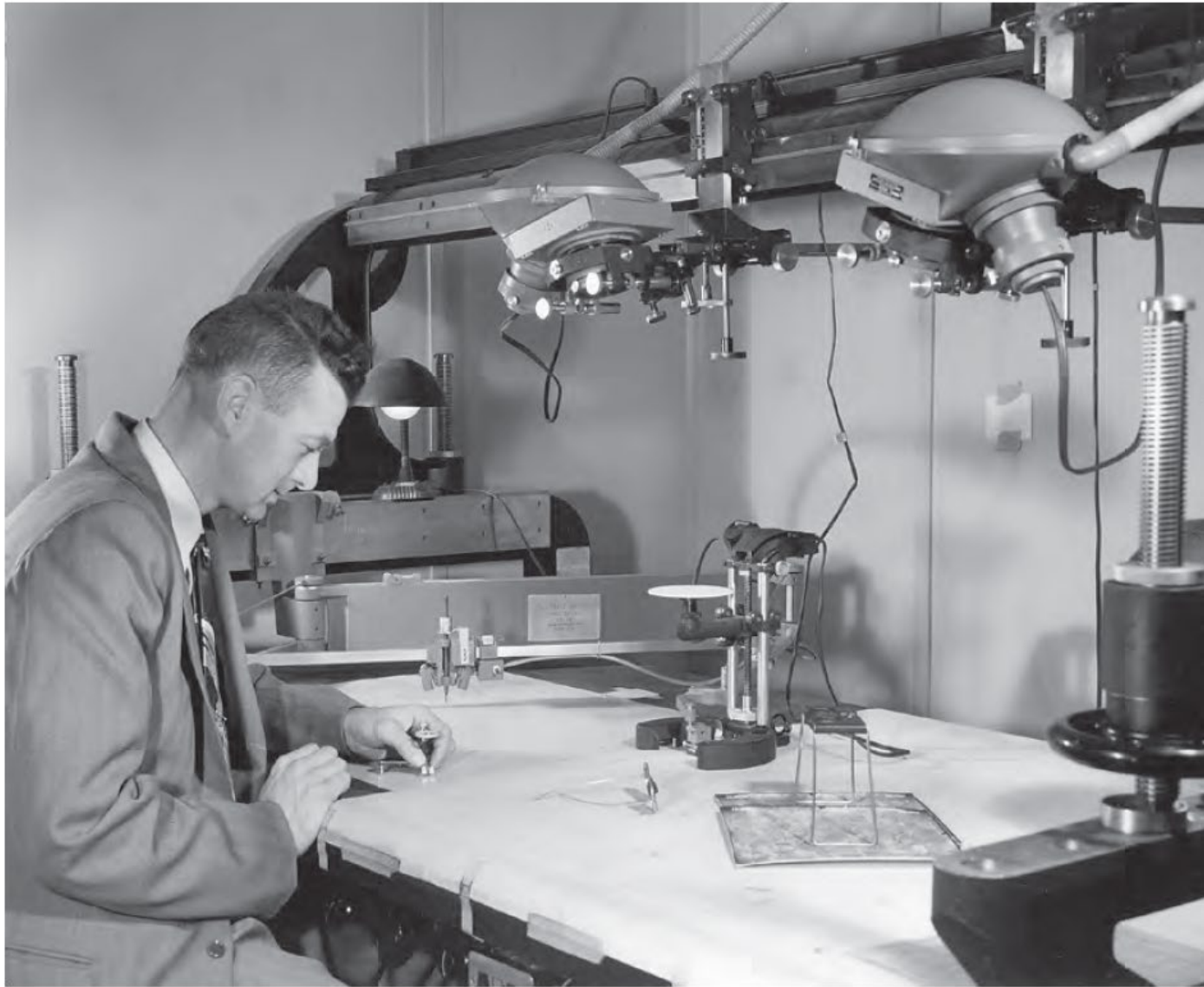
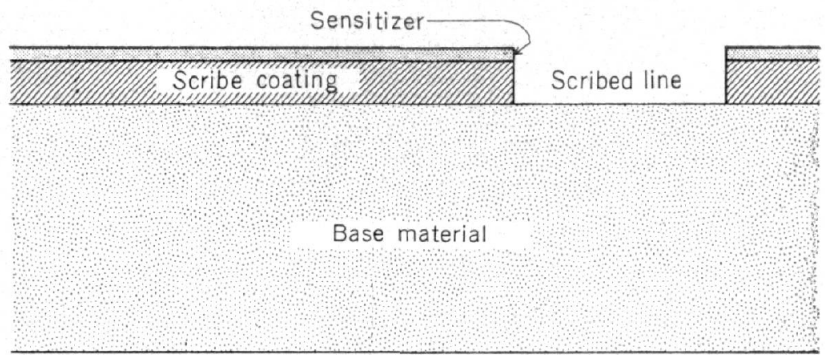


FIGURE 3.—Combined image from stereomanuscript and field manuscript.



**Figure 26.** Russell K. Bean of the U.S. Geological Survey patented the ER-55 stereoplotting instrument, which proved superior to the Multiplex plotter in the compilation phase of topographic mapping.

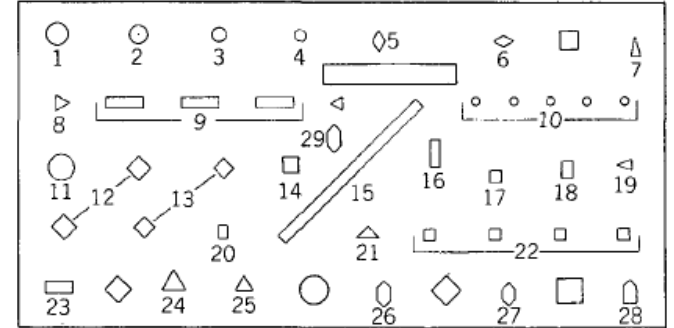


**FIGURE 5.**—Enlarged cross section of a scribed plate.  
Actual thickness 0.008 inch.

The 0.015 in.-templet is designed for scribing symbols at the scales of 1:24,000 and 1:48,000 when used with a standard unsharpened steel Duotone needle

The working edge of the guide is shown with a heavy line at the scribing step indicated. Symbol sizes are illustrative only

- <sup>1</sup> Sharpen Duotone needle to scribe specified symbol line weight
- <sup>2</sup> Use straightedge with templet when scribing these symbols
- <sup>3</sup> Symbol is shown in positive position



SYMBOL		GUIDE		SYMBOL		GUIDE AND SCRIBING SEQUENCE	
134		1		117		8	
138		3				9	
140		22		131		9	
141		27		176		2	
142		29				15	

Space and aline ties with triangular guides

Make RR. track, then shift templet 1/2 space

After a line is scribed, hold position with the graver point, then shift the templet for the next scribing position



# TOPOGRAPHIC INSTRUCTIONS of the UNITED STATES GEOLOGICAL SURVEY

## Color-Separation Scribing

BOOK 4

CHAPTERS 4B1-4B3

1961

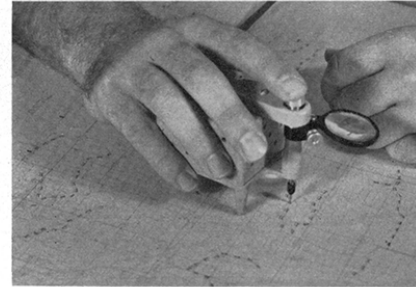


FIGURE 21.—Scribing intermittent streams with the dotter.

are prepared as clearings on a separate negative plate for screening in reproduction. If the marsh or swamp outline is required, it should be scribed on the drainage plate. Other area patterns are applied to the blue plate with negative stickup; if the areas are very small, they may be scribed. Streams running through stickup patterns are preserved by leaving a narrow margin of coating on either side of the scribed line when clearing the area.

#### 42. Scribing red plate

Public-land subdivisions, fence lines, road classifications and destinations, and urban-area tints appear in red on the printed map. Also, some boundaries require a red stipple for accent. Public-land data are shown on a separate plate because they are not required on the military edition. Symbols 508 and 509 usually are applied with negative stickup; all other symbols on the landlines plate are scribed (fig. 22). Fence lines may be scribed on the landlines plate or on a separate plate, depending on operational requirements. In most new mapping, the combination is preferred. The regular red plate includes road-classification data and miscellaneous information such as boundary accent. When urban tint is required, the urban-tint area and the boundary accent, if any, are shown as clear areas on a separate plate for tinting in reproduction.

#### 43. Scribing green (woodland) plate

The green plate depicts and classifies the

woodland features that are printed on the published maps in a light-green tint. All green plates should be prepared in negative form. Timbered areas are cleared of coating.

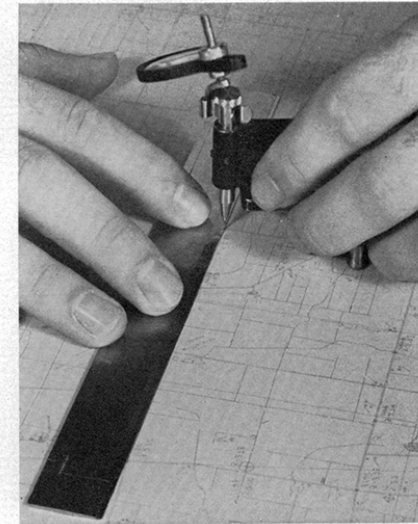


FIGURE 22.—Scribing landlines with rigid graver and straightedge.

Scrub, orchard, and vineyard are applied with stickup after the areas have first been cleared as for timber (fig. 23). Large areas of scrub may be shown as open areas on a

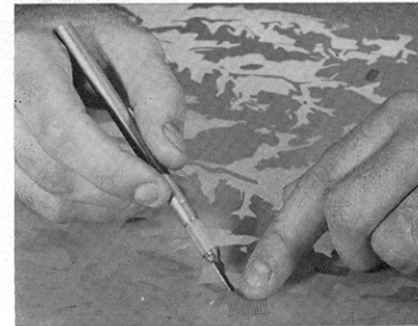


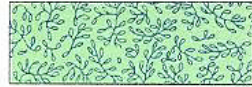
FIGURE 23.—Applying orchard stickup.



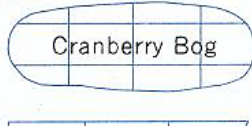


# Color

437 Mangrove \_\_\_\_\_  
 USGS 25 with green tint overprint. See symbol 605.



438 Cranberry bog \_\_\_\_\_  
 Line weight .005". Scribe ditch pattern as compiled. Label.



## MISCELLANEOUS

250 Oil sump or sludge pit \_\_\_\_\_  
 Line weight .003" for outline if constructed of materials other than earth. If earth use Dots .008". Space .017". USGS 17 for fill, or scribe to match. Show only if of landmark value. Label.



251 Open oil reservoir \_\_\_\_\_  
 Outline weight .003". Fill dots .006", spaced .014" center to center. USGS 5. Label.



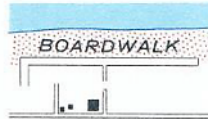
252 Drive-in theater \_\_\_\_\_  
 Outline area with symbol 209. Show structures. Label Drive-in Theater. Screen line weight .007".



253 Coke ovens \_\_\_\_\_  
 Overall width .02". Casing line weight .003". Fill dash .03", space .02". Label.



254 Boardwalk \_\_\_\_\_  
 Overall width to scale with minimum .02". Line weight .003". Label.



306 Carrying contour \_\_\_\_\_  
 Line weight .007", .002". At cliffs embankments and like features where contours merge into one, line weight to agree with contours superimposed.



307 Depression contour \_\_\_\_\_  
 Tick weight .002". Length .02". Space .12". Spacing to be decreased for small depression.



308 Adjacent depression contours \_\_\_\_\_  
 Tick weight .002". Length .02". Space .04" on lowest contour. Increase space to .08", .12" on succeeding contours. .12" space on all others.



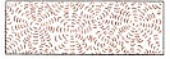
309 Supplementary depression contours \_\_\_\_\_  
 See symbols 307 and 308 for tick specifications and 302 for dashes.



310 Cut \_\_\_\_\_  
 Plot contours in correct position. Space from road, railroad (line), etc. .005".



324 Tailings \_\_\_\_\_  
 Maintain pattern as compiled. Label.



325 Areal strip mine \_\_\_\_\_  
 USGS 21. Label.



With regular ridges and furrows \_\_\_\_\_  
 Maintain pattern as compiled. Label.



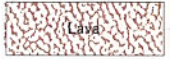
326 Linear strip mine \_\_\_\_\_  
 Line weight .002". Label.



327 Mine dump \_\_\_\_\_  
 Line weight .002".



328 Intricate surface area \_\_\_\_\_  
 USGS 21 on separate plate. Label.



329 Gravel beach \_\_\_\_\_  
 USGS 22.



## UNITED STATES LAND SURVEYS

500 Land grant or mining claim \_\_\_\_\_  
 Line weight .005". Dash .25". Dot .008". Space between dashes .10". Scribe complete when coincident with single line stream. Show in road only if needed to clarify. If road carries red fill label and omit boundary.



501 Land grant monument with or without geodetic position \_\_\_\_\_  
 Line weight .003". Sides .04". Dot .006". When on boundary line orient with line.



502 Township or range line \_\_\_\_\_  
 Line weight .01".



503 Township or range line: location doubtful \_\_\_\_\_  
 Line weight .01". Dash .10". Space .02".



504 Section line \_\_\_\_\_  
 Line weight .005".



505 Section line: location doubtful \_\_\_\_\_  
 Line weight .005". Dash .10". Space .02".



506 Section corner: found—indicated \_\_\_\_\_  
 Line weight .01"—.005". Length .06". Space .033". USGS 1.



517 Change in number of lanes \_\_\_\_\_  
 Line weight .005". Length .07". Tick at right angle to road. Label if more than 2 lanes.



518 Direction or destination arrow \_\_\_\_\_  
 USGS 11.

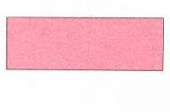


519 Route markers \_\_\_\_\_  
 USGS 9, 9A, 10.

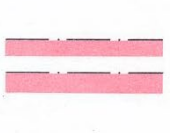


## MISCELLANEOUS

520 Urban area \_\_\_\_\_  
 Make separate plate. Clear tint from parks and cemeteries and from colleges, schools, hospitals, etc., with grounds equal to or larger than average city block on map.

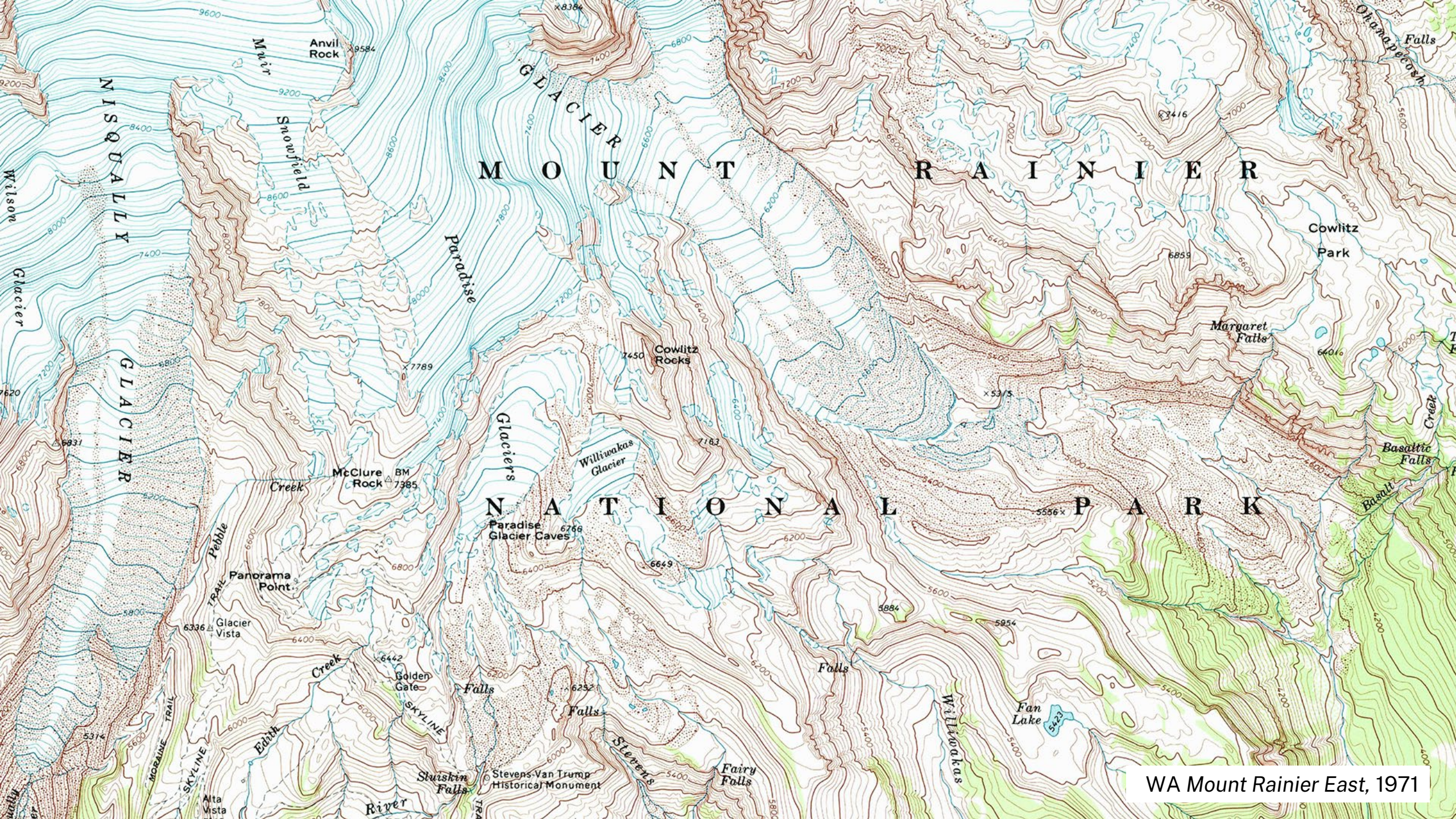


521 National park or monument boundary \_\_\_\_\_  
 USGS 33 and 33-1. Width .09" for 24 000, .11" for 48 000. May be used to accentuate other boundaries when line is difficult to trace. If urban tint plate, clear and use no pattern.

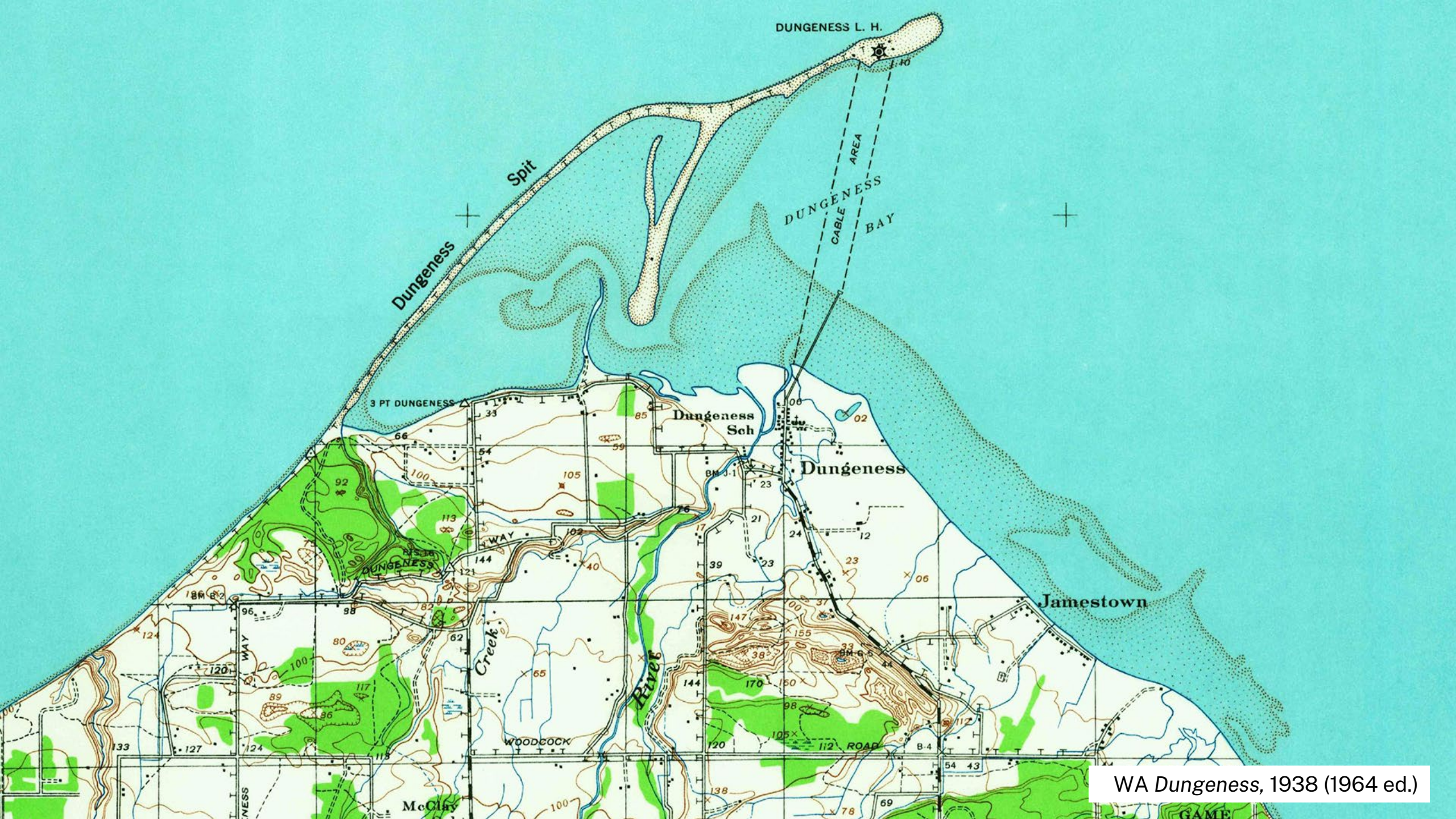


522 Fence line \_\_\_\_\_  
 Line weight .002". Dash .10". Space .02". Use in non-land-office States except Texas. See symbol 188 for land-office States and Texas.





WA Mount Rainier East, 1971



WA Dungeness, 1938 (1964 ed.)



# Leroy lettering



**Mzs** Epiclastic Rocks (Mesozoic?) – predominantly slate and phyllite, minor tuff and graywacke, age unknown.

**Jmf** Merced Falls Slate (Upper Jurassic) – same as Js

**SMARTVILLE BLOCK**

**Jvu** Upper Volcanic Unit (Upper Jurassic?) – mafic to felsic pyroclastic rocks, includes massive and pillow lavas, subordinate quartz-albite porphyry, some dikes, maybe gradational with Jw.

**Jvl** Lower Volcanic Unit (Upper Jurassic?) – predominantly mafic to intermediate pillow and massive lavas and associated volcanoclastic rocks, includes abundant dikes towards base. Jvlf – local felsic volcanic centers with quartz-albite porphyry pyroclastic and subvolcanic intrusive units. **Jvlf**

**Mzi** Dike and Plutonic Complex (Middle-Upper Jurassic?) – mafic dikes, sills and granitoid intrusives, includes basaltic, diabasic and minor quartz porphyry to trondhjemite dikes and gabbro, diorite, hbdiorite and trondhjemite plutonic bodies. Includes plutonic portion of the Pine Hill Complex.

**CENTRAL BLOCK**

Mother Lode Belt

**Jm** Mariposa Formation (Upper Jurassic) – epiclastic slate, argillite and phyllite with minor graywacke and conglomerate. **Jmb** – Brower Creek Member, mafic to intermediate interbedded pyroclastic and flow units. **Jmb**

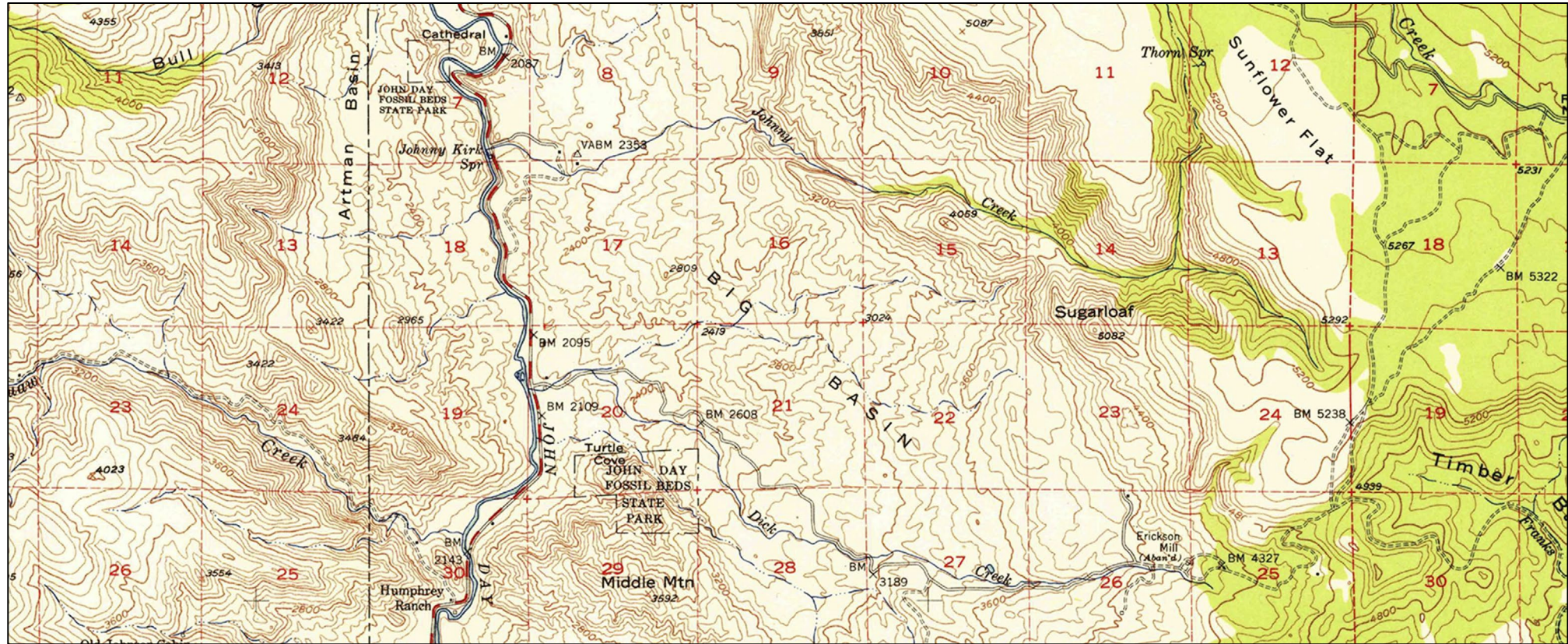
**Jl** Logtown Ridge Formation (Upper Jurassic) – mafic to intermediate pyroclastic rocks commonly with clinopyroxene phenocrysts, local massive and pillow lavas.

**Jp** Penon Blanco Volcanics (Jurassic?) – mafic to intermediate clinopyroxene phyric volcanics, lower sections with dominant massive and pillowed lavas, upper portions dominantly pyroclastic, including very minor felsic tuffs. Unit is possibly correlative with the Bear Mountain Ophiolite and may overlie the Tuolumne Ultramafic Complex.

Basement Belt

**Jc** Cosumnes-affinity Rocks (Upper Jurassic?) – epiclastic slate, phyllite, graywacke and minor conglomerate, locally tuffaceous and interbedded with Jv units.

# Leroy lettering



OR Picture, 1953

# Registration

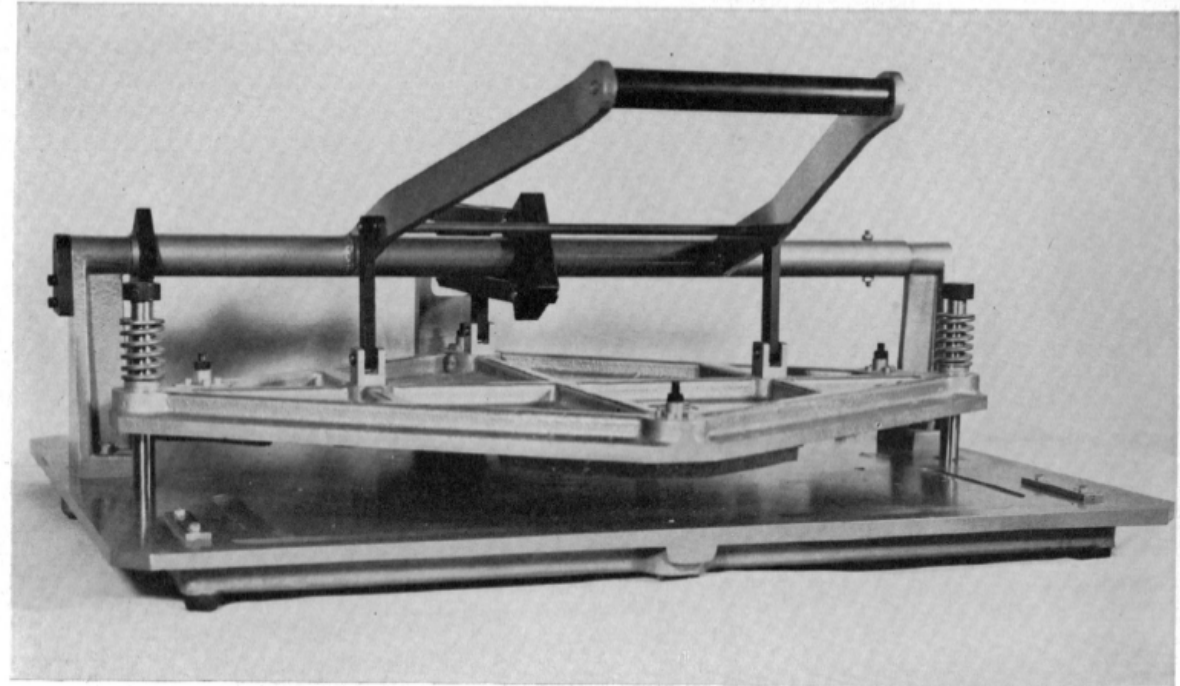


Stickybusiness.com



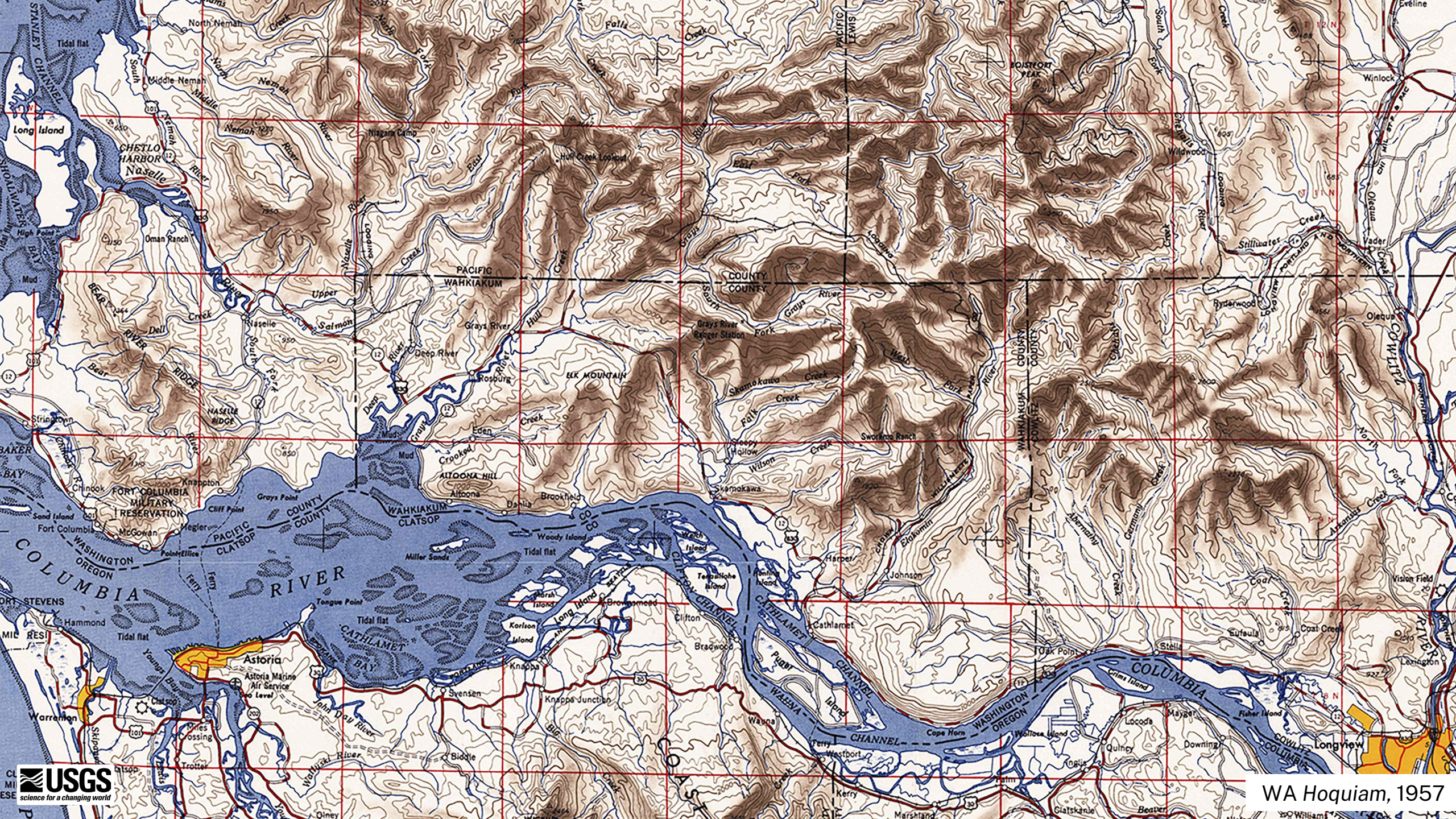
22

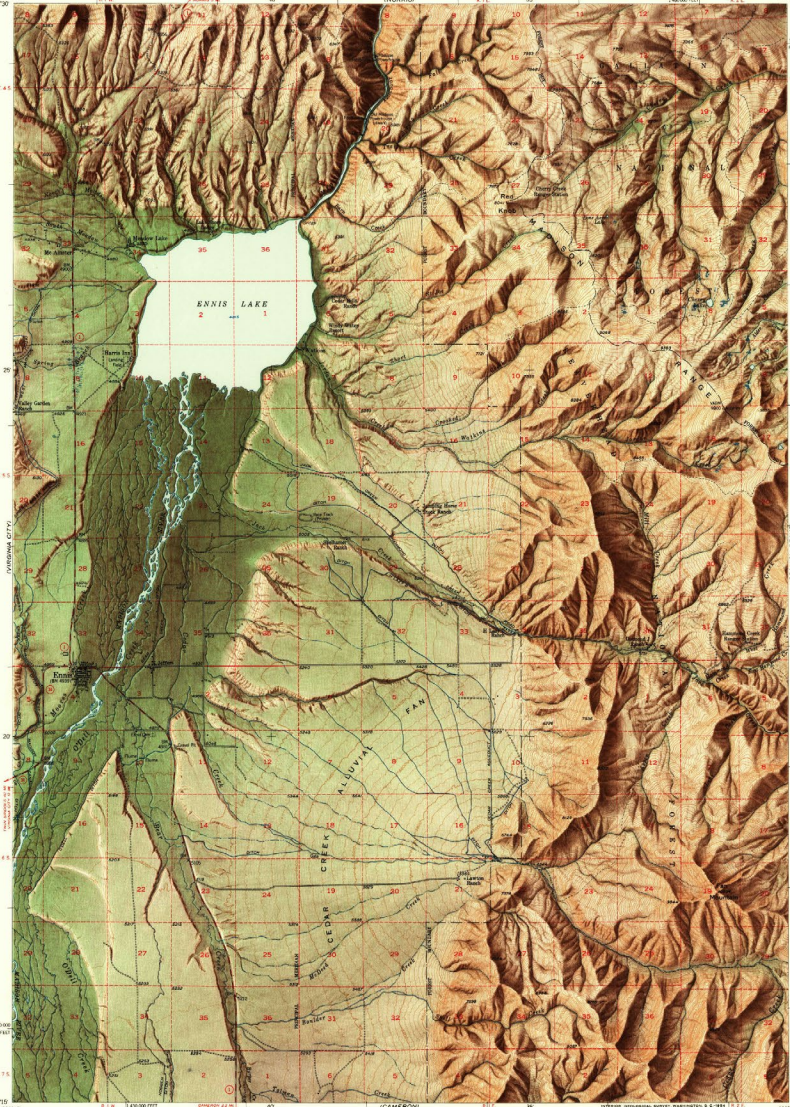
COLOR-SEPARATION SCRIBING



# Relief







FILE COPY

USGS  
Historical File  
Topographic Division

FILE COPY

Stereos compiled by Fairchild Aerial Surveys, Inc., for the Bureau of Reclamation. Field examination and publication by the Geological Survey as part of the Department of the Interior program for the development of the Missouri River Basin.

Control by USGS and USCRS. Topography from aerial photographs by stereographic methods, 1948. Aerial photographs taken 1947. Field lines 1948.

Projection: 1927 North American datum. 1:25000 the first sheet in the Missouri River Basin series.

Dashed and long lines indicate approximate boundaries. Unchecked elevations are shown in brown.

SCALE 1:62500

CONTOUR INTERVAL: 40 FEET (shown in black on level)

ROAD CLASSIFICATION

Heavy-duty	Light-duty
Medium-duty	Unimproved dirt
U.S. Route	State Route

ENNIS, MONT.  
NAD15-NAD1130/75  
1949

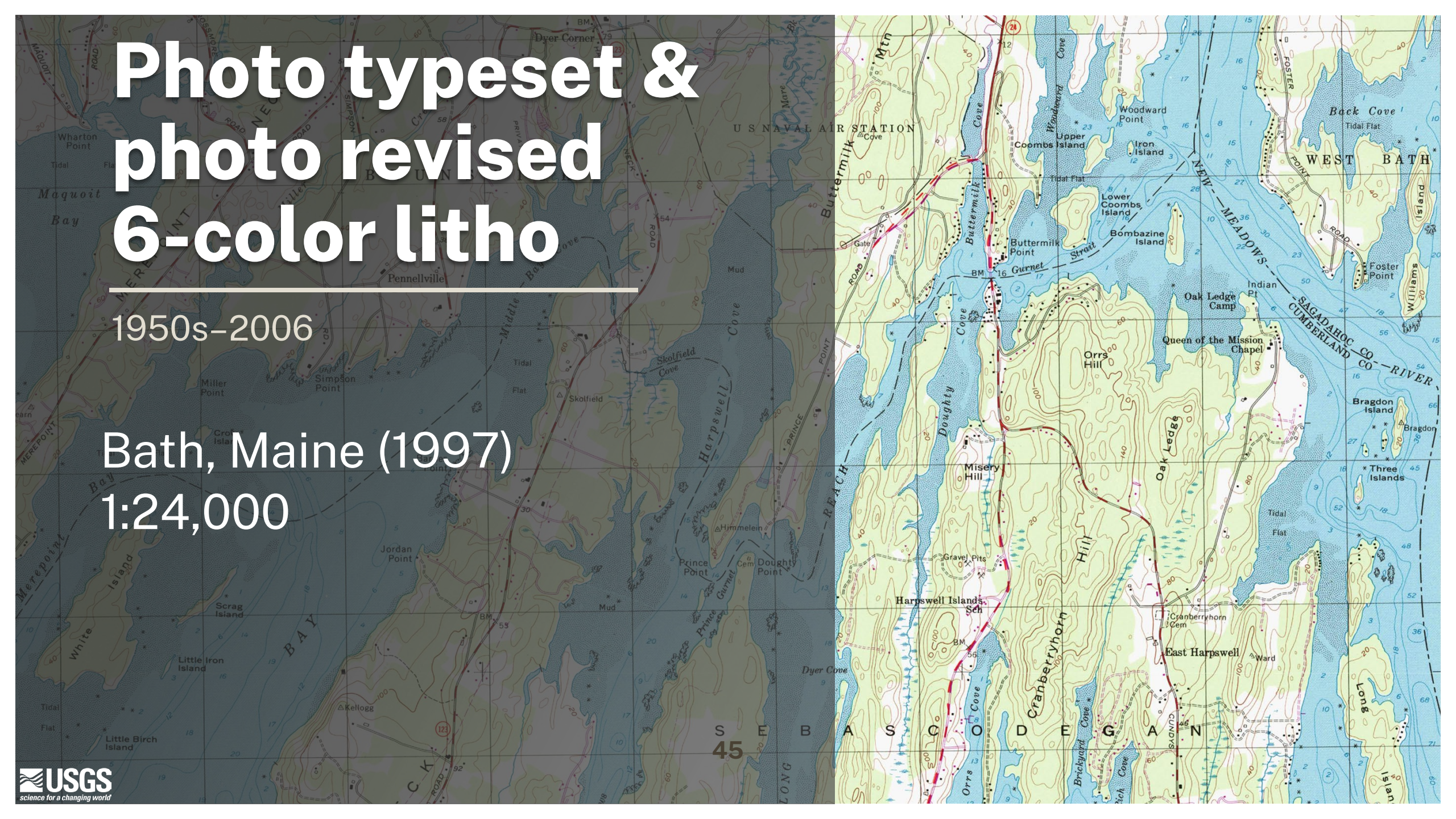


MT Ennis, 1949

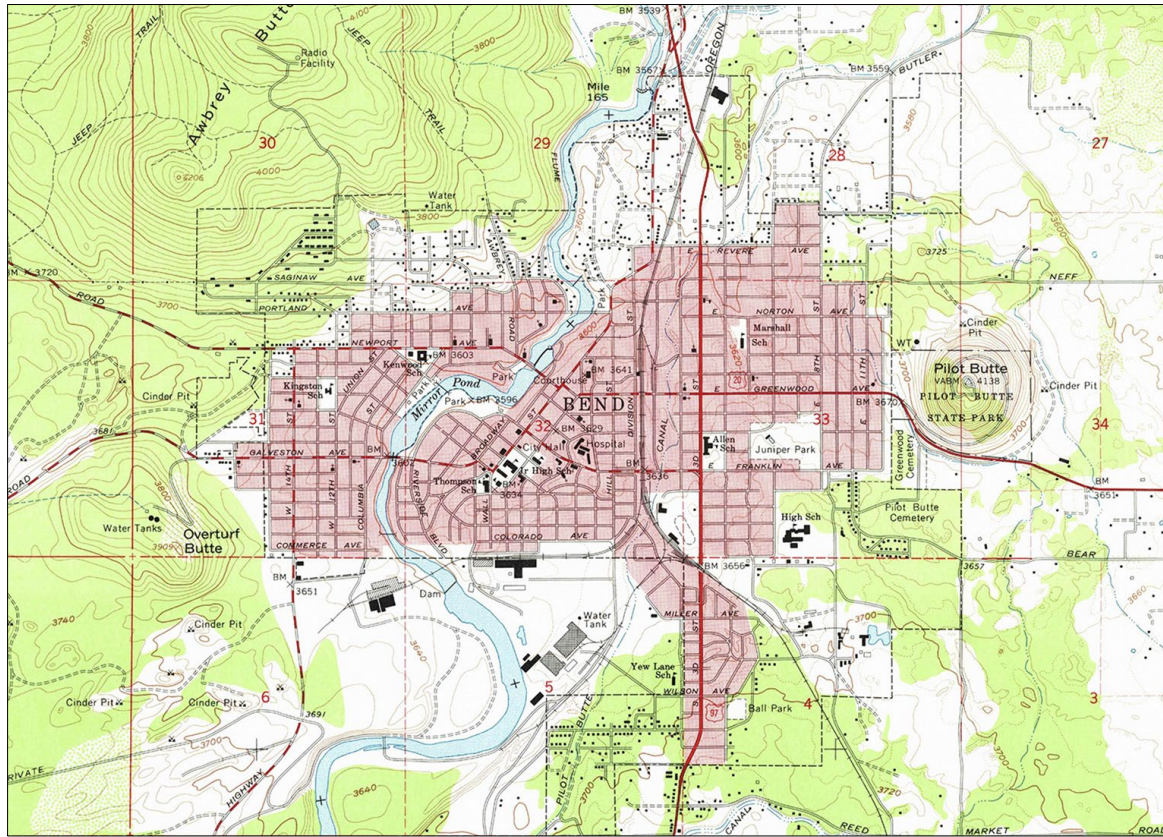
# Photo typeset & photo revised 6-color litho

1950s–2006

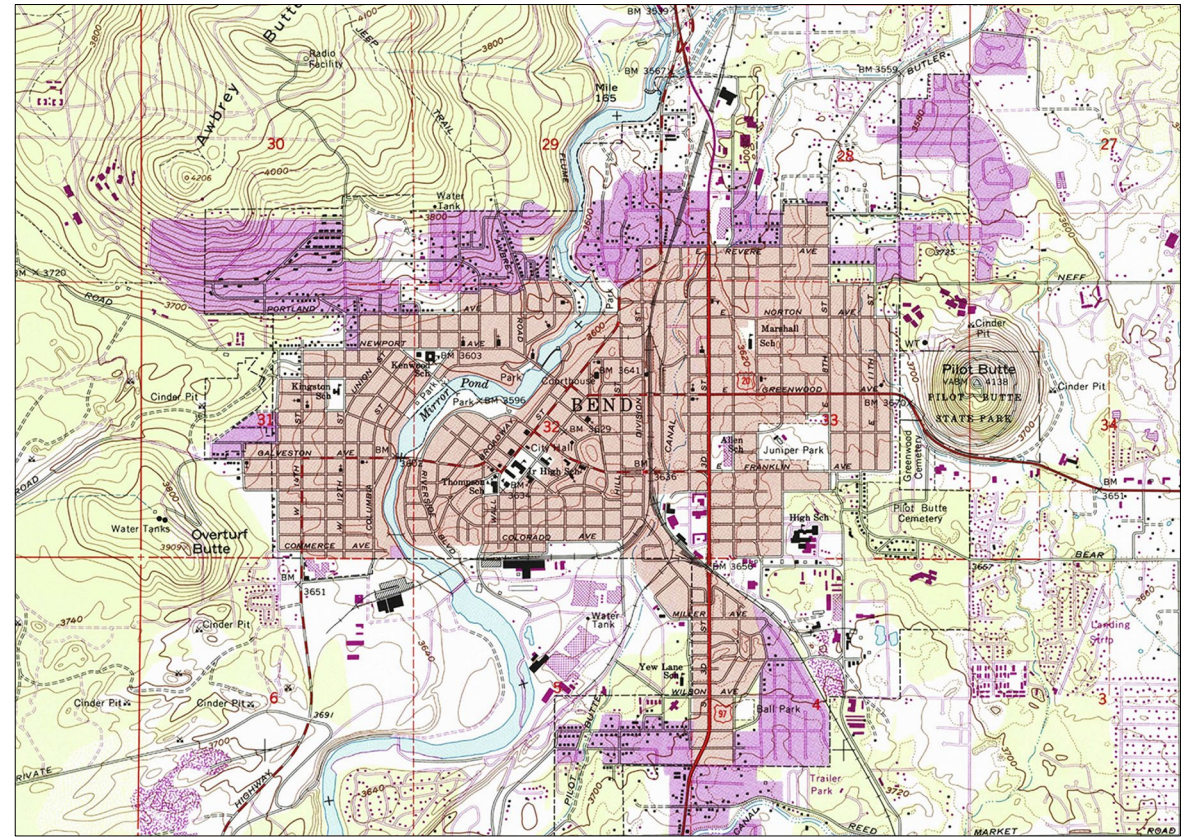
Bath, Maine (1997)  
1:24,000



# Photo revision



OR Bend, 1962

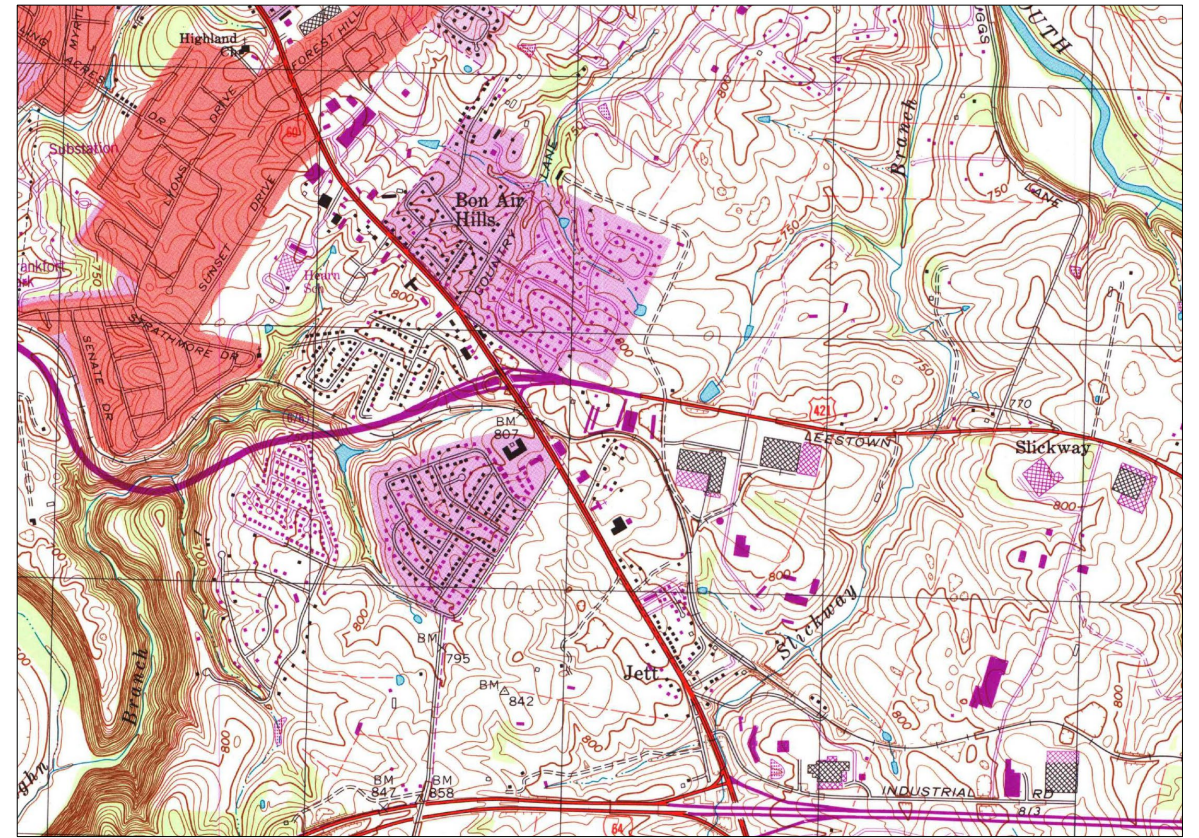


OR Bend, 1962 photorevised 1981

# Photo revision



KY Frankfort East, 1959



KY Frankfort East, 1996

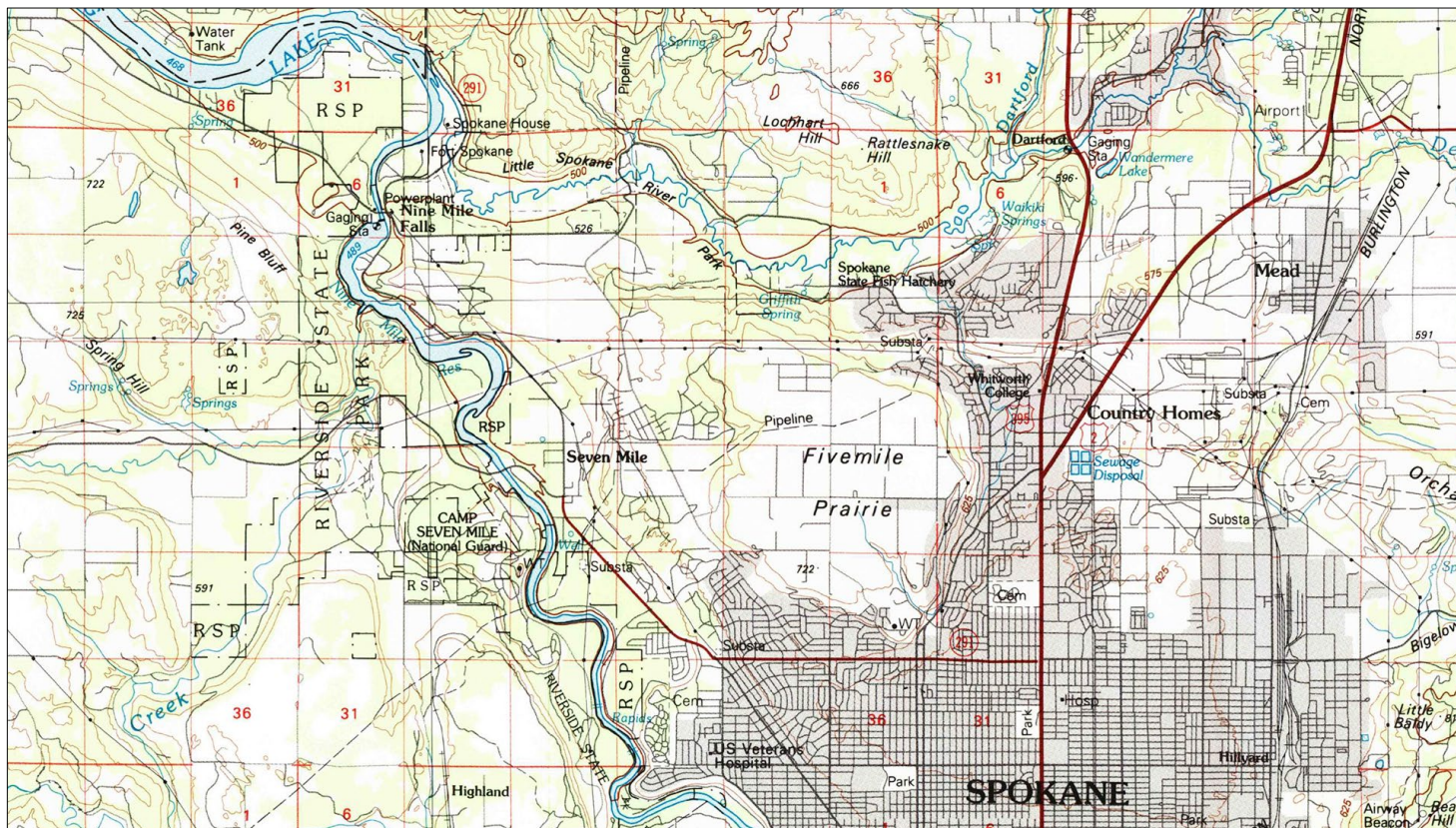


# Phototypesetting





# ITC Souvenir



WA Spokane, 1987

Produced by the United States Geological Survey

Compiled from USGS 1:24 000-scale topographic maps dated 1965-1969. Planimetry revised from aerial photographs taken 1981 and other source data. Revised information not field checked. Map edited 1983

Projection and 10 000-meter grid, zone 11,  
Universal Transverse Mercator  
25 000-foot grid ticks based on Idaho coordinate system,  
west zone and Montana coordinate system, north zone  
1927 North American Datum  
To place on the predicted North American Datum 1983  
move the projection lines 12 meters north and 77 meters east

There may be private inholdings within the boundaries of  
the National or State reservations shown on this map

CONTOUR INTERVAL 50 METERS  
NATIONAL GEODETIC VERTICAL DATUM OF 1929

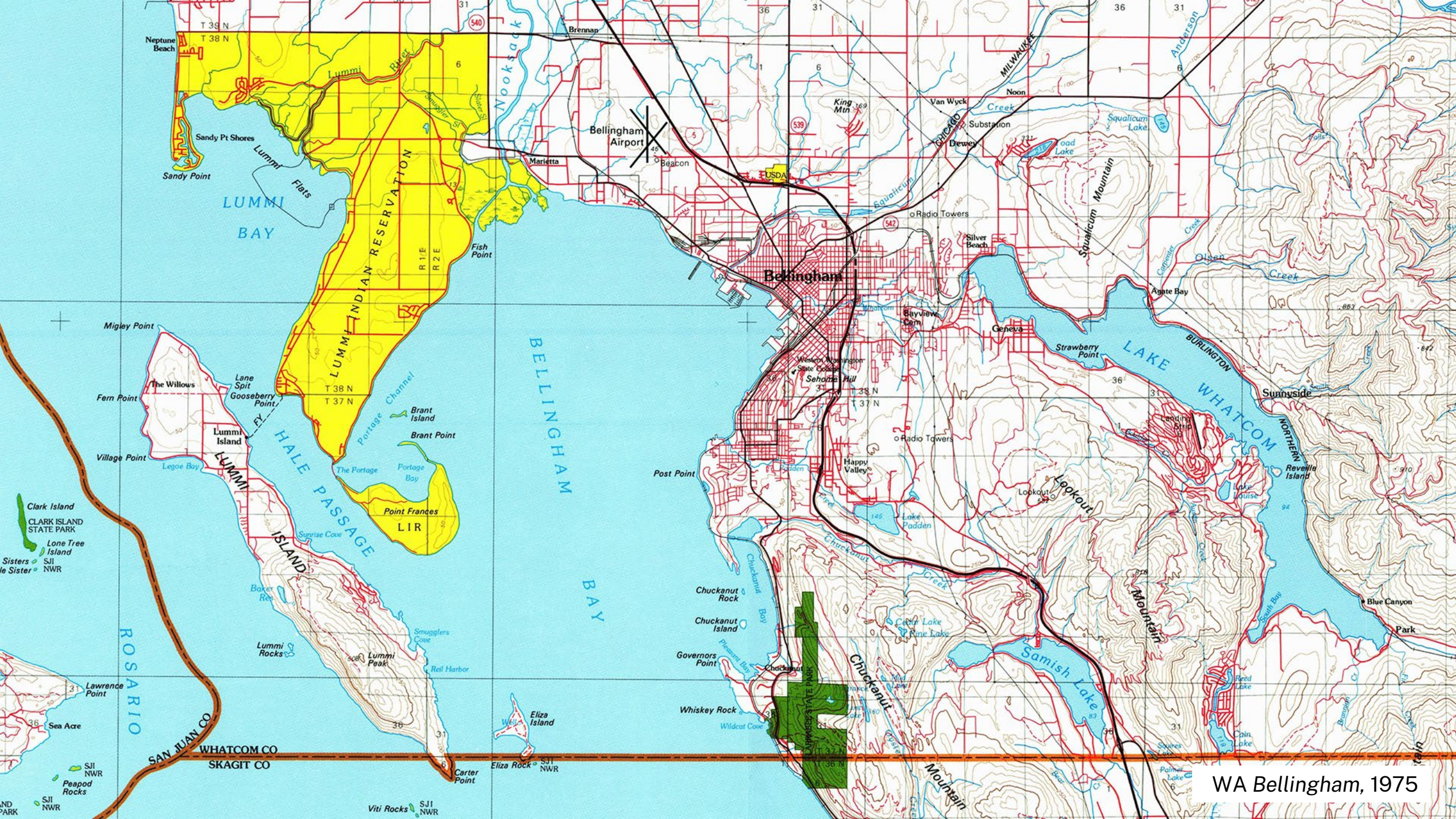
THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS



# ITC Souvenir

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An image was sought, but what kind of image does Souvenir project? The International Typeface Corporation catalogue describes it as giving "a delightfully warm, contemporary mood" and indeed the type is used for many kinds of advertising where this effect is desired. It is almost never used for official documents calling for an authoritative style, and on the contrary is frequently used by large institutions or firms that wish to downplay their authority in a given situation, such as the telephone company asking its customers for a rate increase, or a large pharmaceutical company defending its actions to the public.



Clark Island  
CLARK ISLAND  
STATE PARK

Lone Tree  
Island

Sisters  
SJI  
le Sister NWR

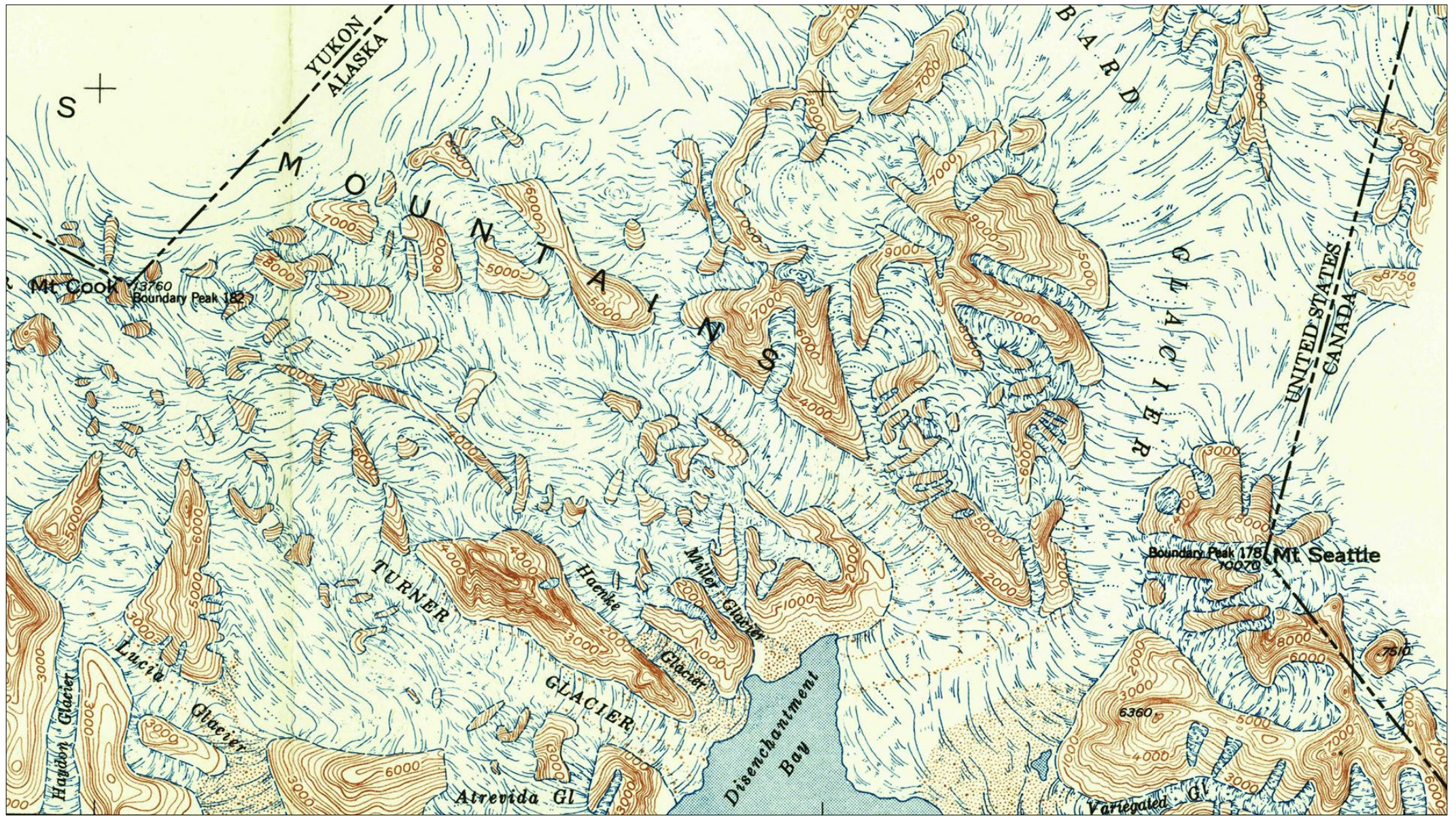
Peapod  
Rocks

SJI  
NWR

SJI  
NWR

SJI  
NWR

WA Bellingham, 1975



AK Mount Saint Elias, 1955



AK Mount Saint Elias, 1959/1970

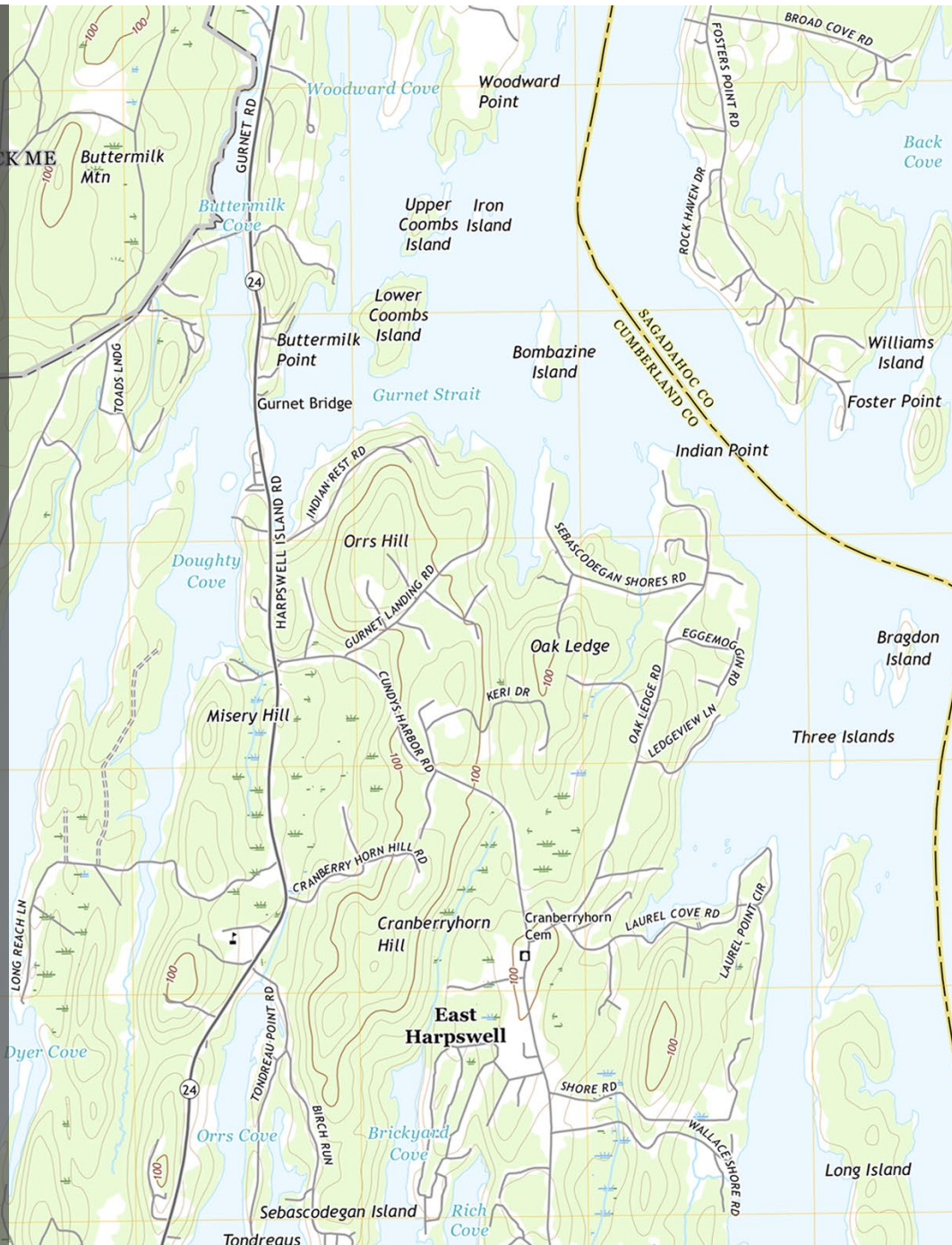
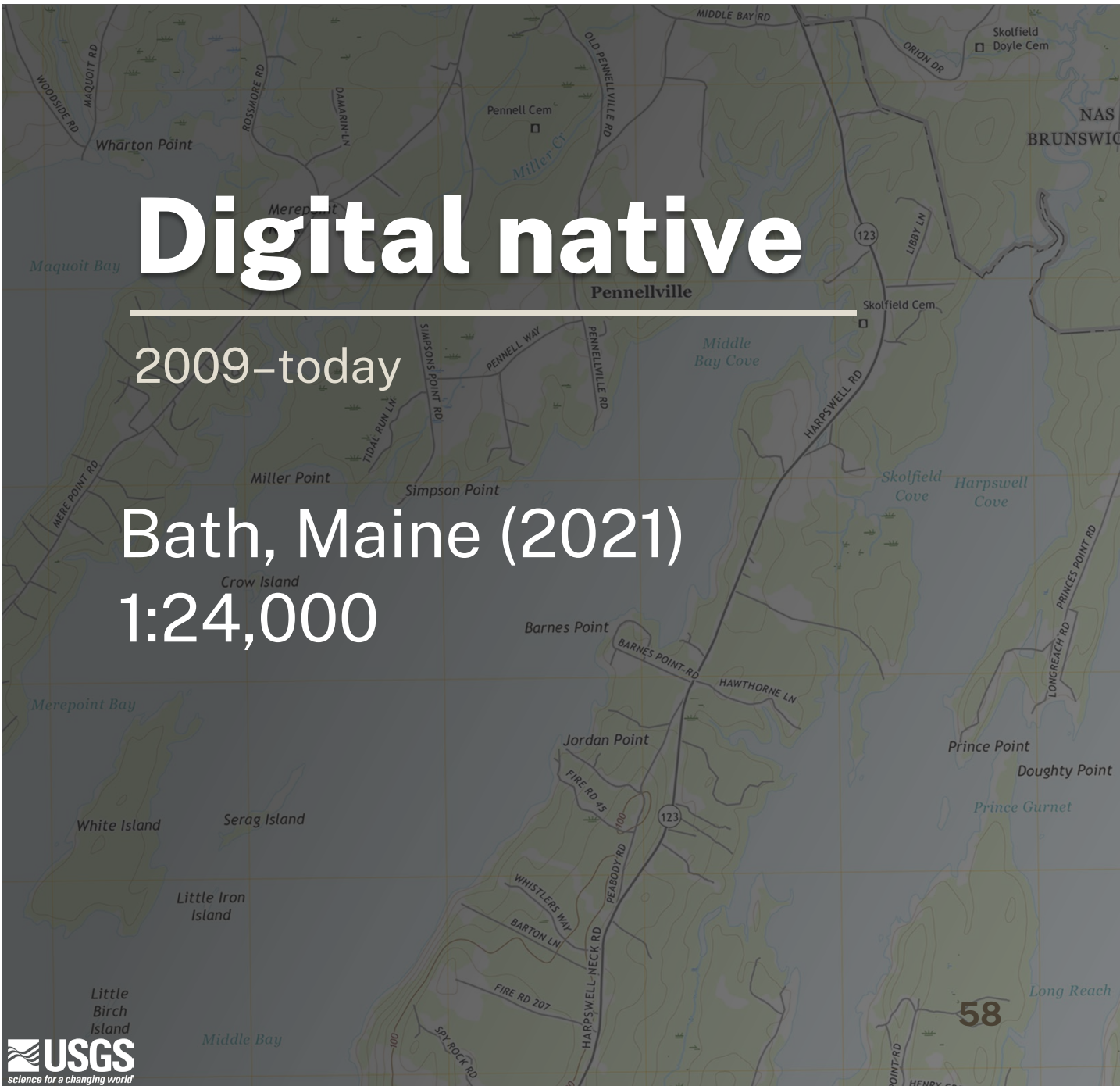


AK Mount Saint Elias, 1959/1983

# Digital native

2009–today

Bath, Maine (2021)  
1:24,000





A grayscale topographic map showing a mountainous region with a river network. The terrain is rendered with shading to indicate elevation and contour lines.

# The new generation of topo mapping

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60

# topoBuilder

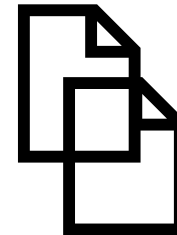
[topobuilder.nationalmap.gov](http://topobuilder.nationalmap.gov)



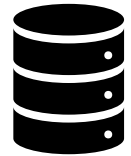
**on demand**



**where  
you want**



**multiple  
formats**



**best  
available  
data**

# OnDemand Topo

## 7.5-Minute Topo

- 1:24,000 (CONUS & HI)
- 1:25,000 (Alaska)
- 1:20,000 (Territories)

## 25K Topo

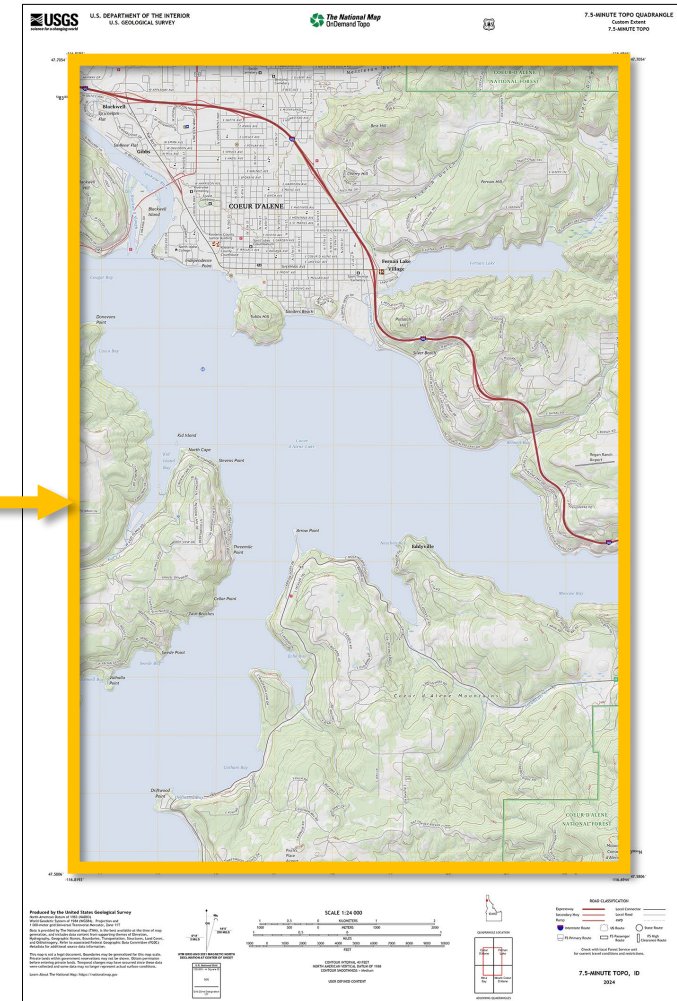
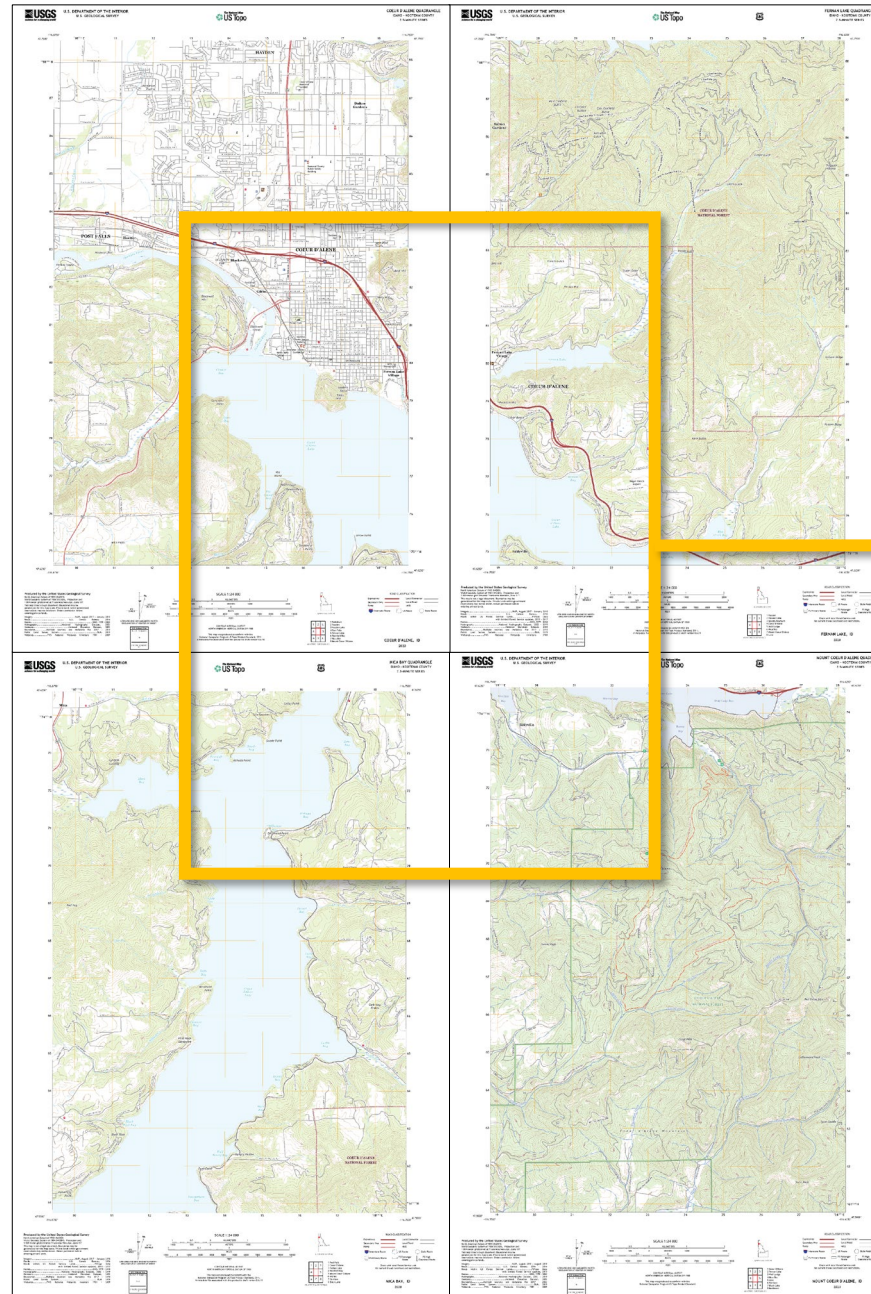
- Recreational focus

## 100K Topo

- Regional planning

## 250K Topo

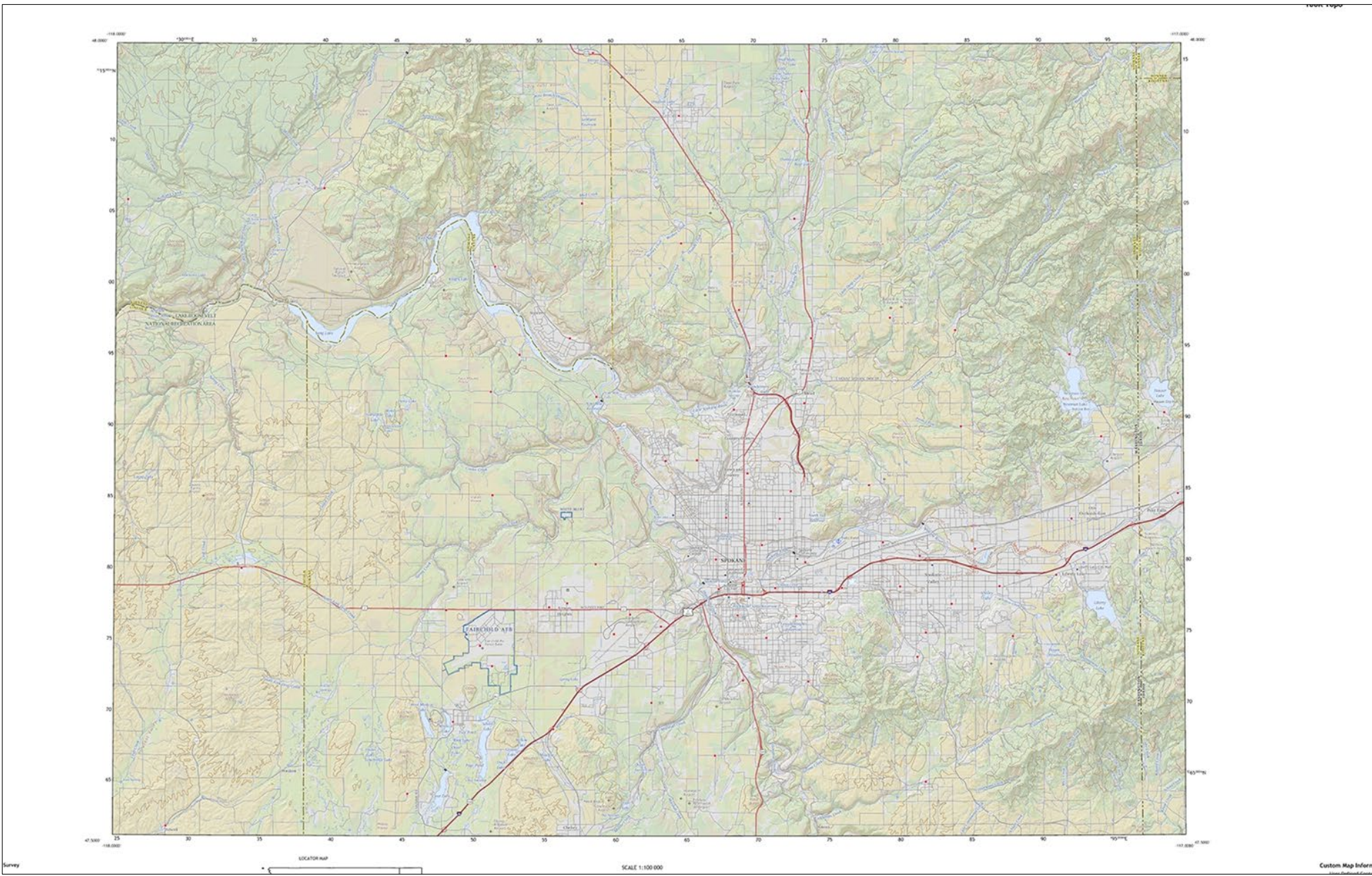
- Regional planning



Custom extent OnDemand Topo covering Coeur D'Alene, Fernan Lake, Mica Bay, and Mount Coeur D'Alene US Topo quads, Idaho





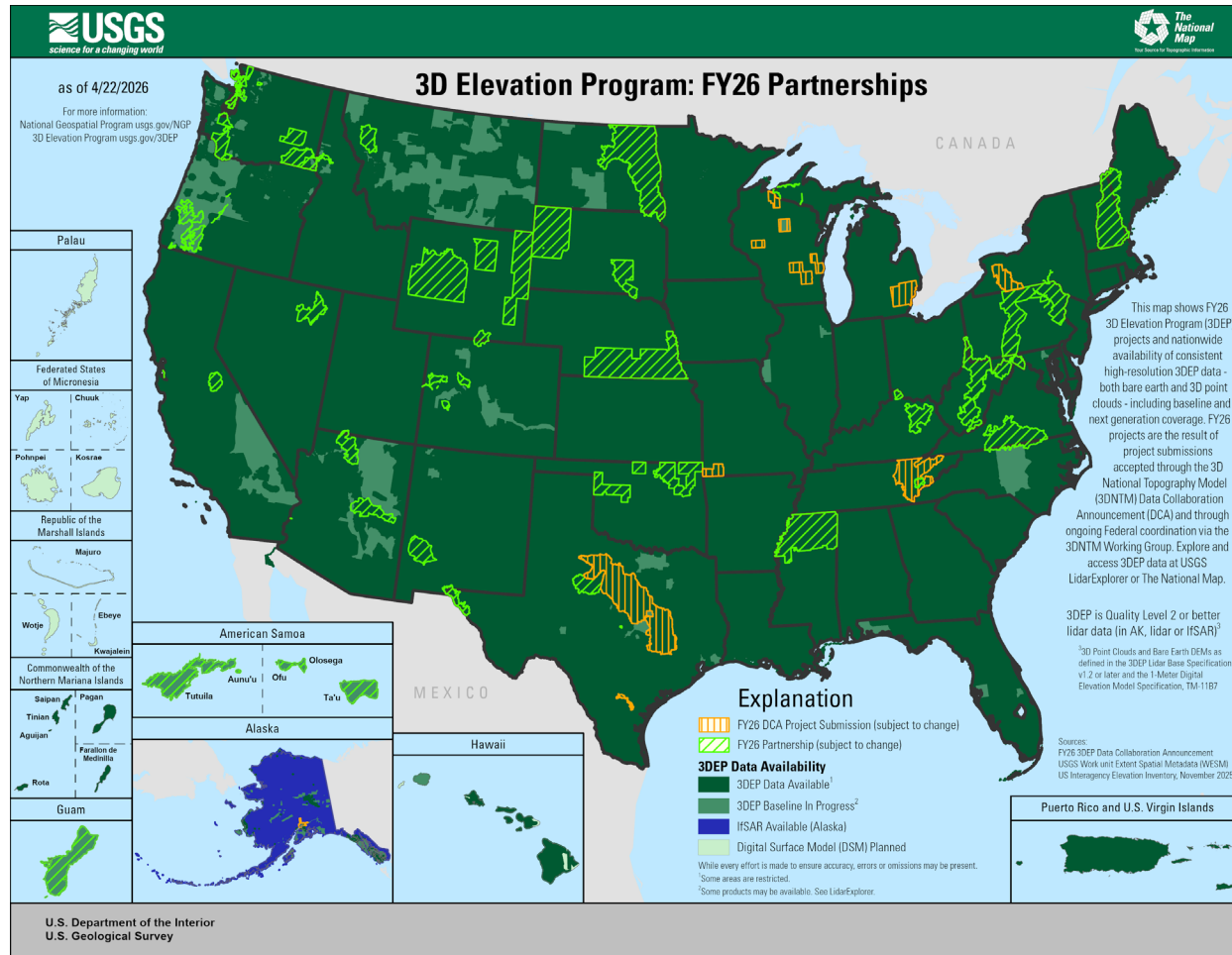


Survey LOCATOR MAP SCALE 1:100,000 Custom Map Inform



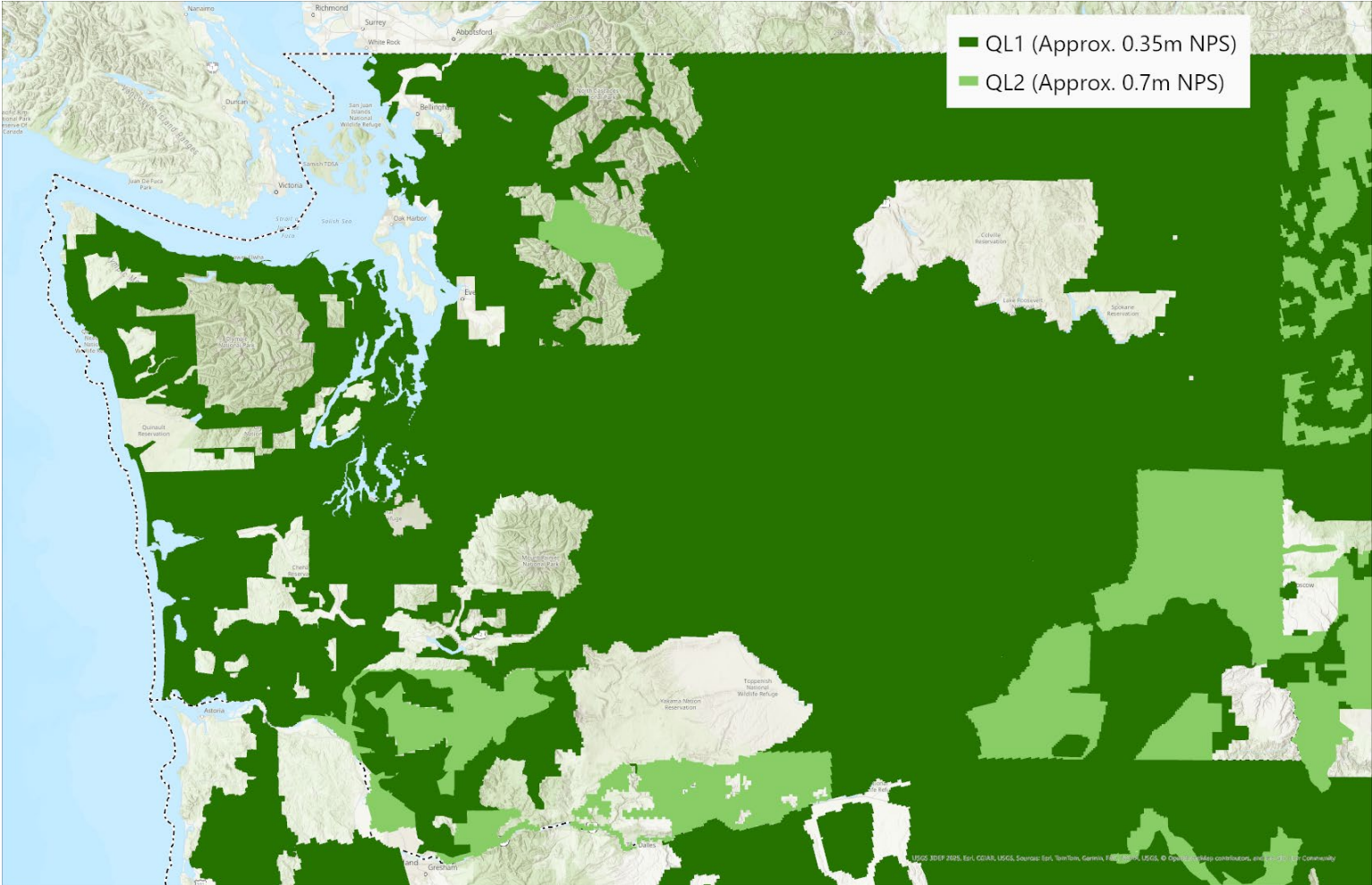
# The National Map

# 3DEP: 3D Elevation Program

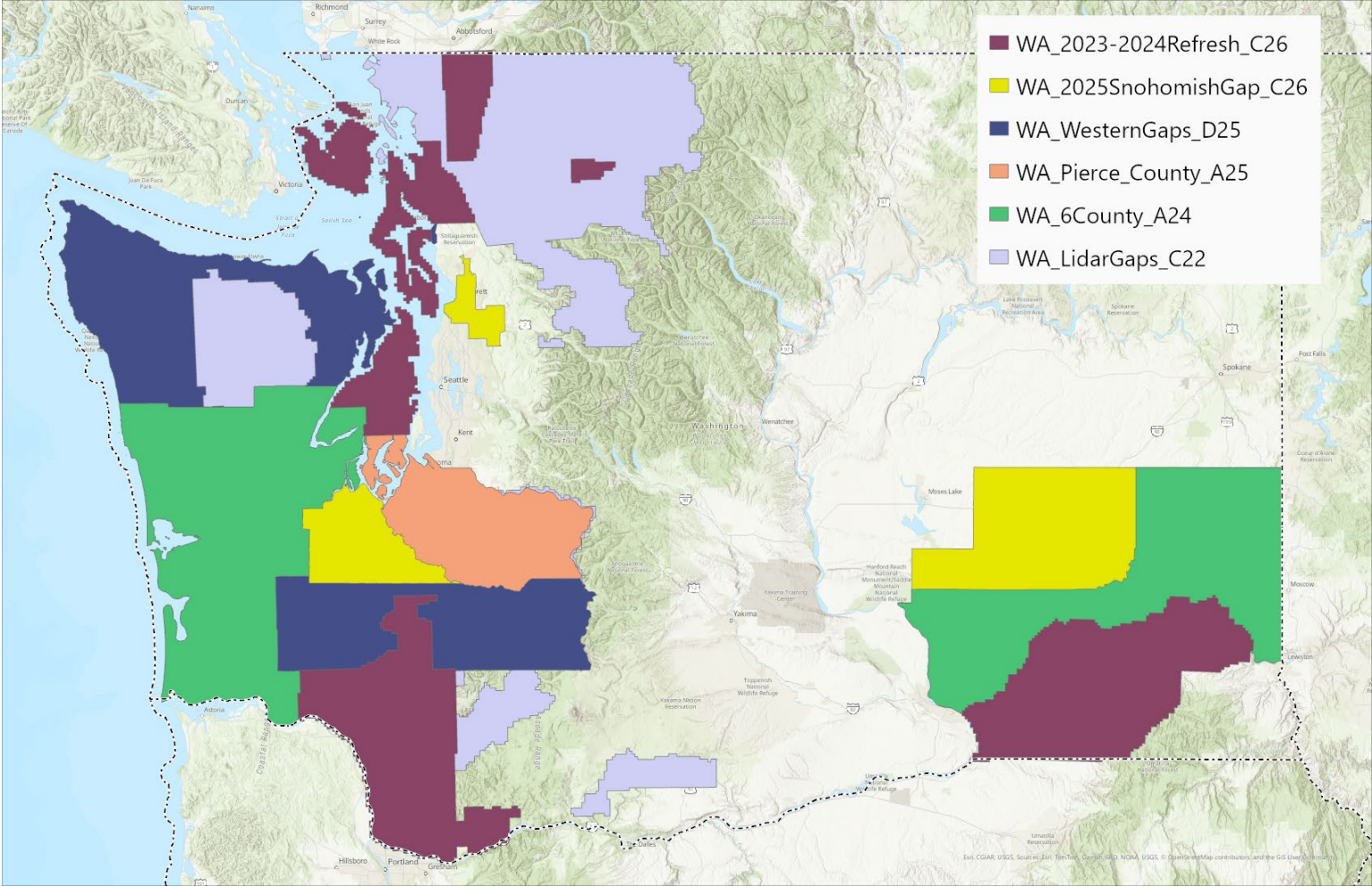


USGS LidarExplorer

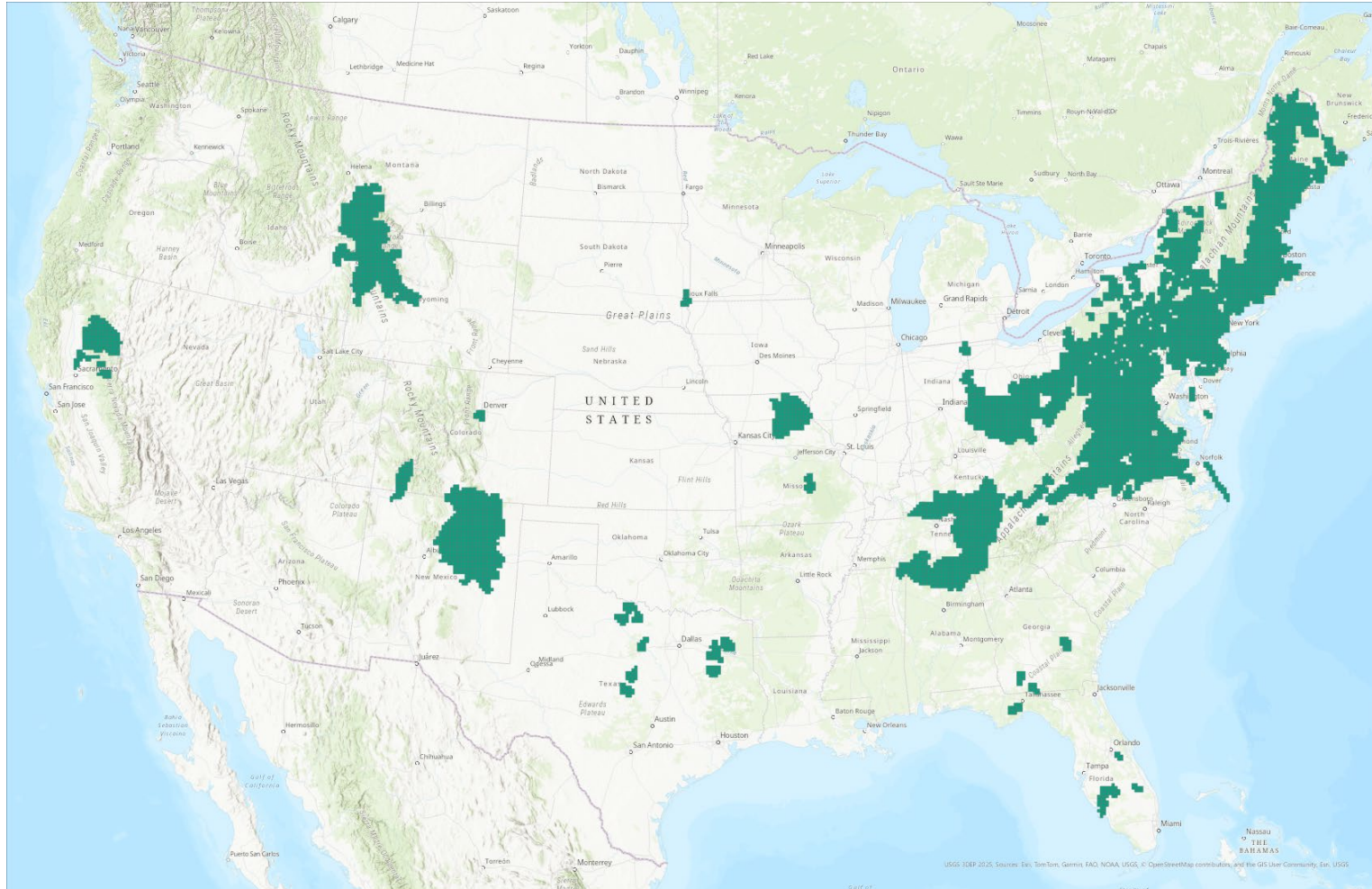
# 3DEP available



# 3DEP in progress

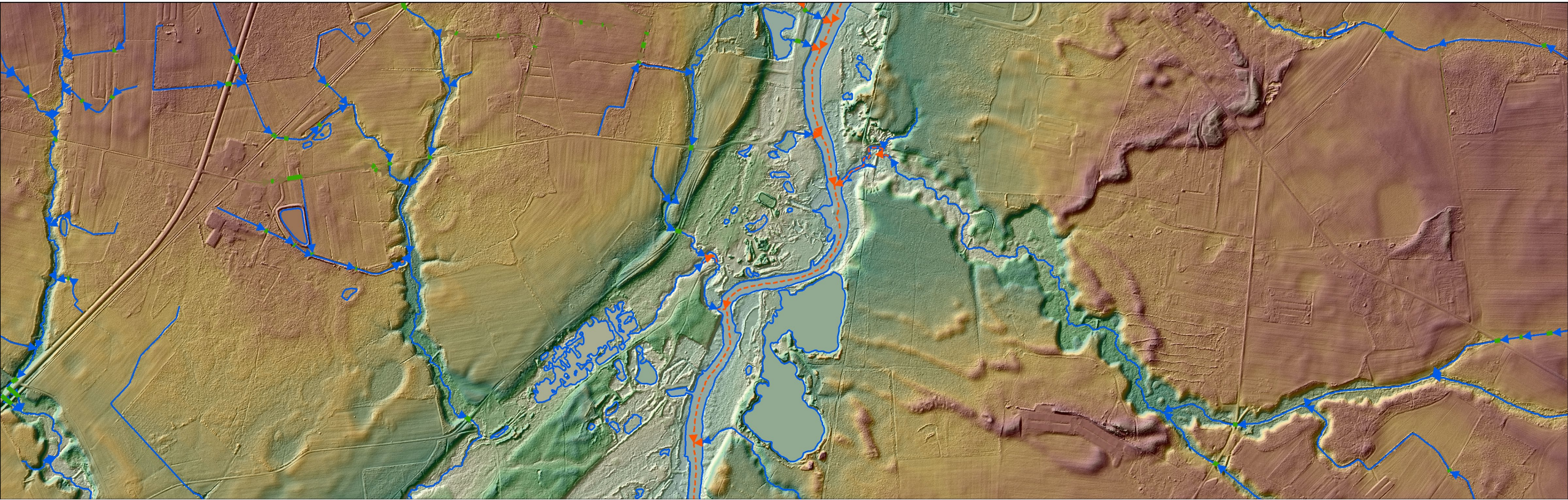


# Seamless 1m DEM

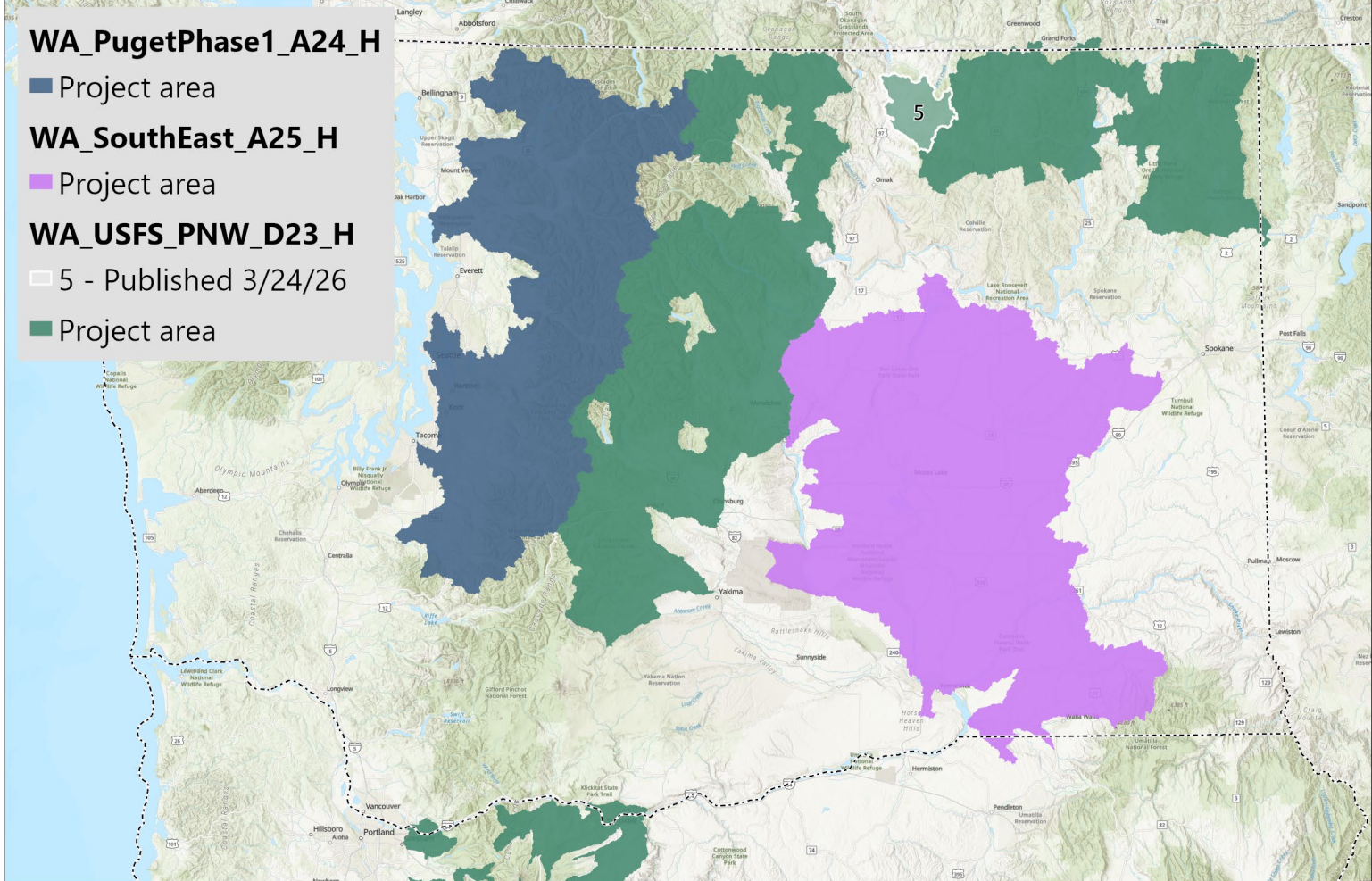


# 3DHP: Elevation-derived hydro

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# 3DHP in progress



# A note on the font

Public Sans

<https://public-sans.digital.gov/>



A topographic map of a region in the Pacific Northwest, showing contour lines, rivers, and various landmarks. The map includes labels for 'Fennell Lake', 'Thomas', 'Gilkey', 'Hungry Hill', 'Franklin Butte', 'Richardson Gap', 'Prospect Mtn', 'Crabtree Creek', 'Fry Mill Cr.', 'Lakeview School', 'Balm', 'Cold Spring', 'Grigg's', 'Nelson Bridge', 'Providence School', and 'Games School'. A grid of section numbers is overlaid on the map. Two dark rectangular boxes with white text are superimposed on the map. The USGS logo is in the bottom left corner.

**Thank you**

**Text me: 720-768-9610**

**Email me: [eguidero@usgs.gov](mailto:eguidero@usgs.gov)**