Braided River Revival
Whakahaumanu Ngā Awa ā Pākihi

- To provide a clear goal - revival of braided rivers ki uta ki tai
- To align collective action at a landscape level to achieve that goal

BRaid Seminar 11 July 2021

Environment Canterbury Regional Council
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Braided River Revival
Whakahaumanu Ngā Awa ā Pākihi

ECan Internal

- Braided River Revival Strategies – 9 Strategies over 10 years
- Regional Parks - Currently Waimakariri and Ashley Rakahuri
- Priority Braided River projects across the Region and Flagship Projects in Rangitata and Rakaia Catchments

External

- Alignment with Rūnanga and Agency Partners
- Community partnerships

Revival Strategies

River by River

- Aspirations and actions – connections between people and rivers
    - Ashley River/Rakahuri
    - Rangitata – restore the mauri of the Rangitata River

Scope

- Non statutory
- mountains to sea - ki uta ki tai (lowland streams and wetlands)

Process

- Co-design with rūnanga and agency partners
- Goals and objectives – work streams
- Engagement with stakeholders

River Engineering to Rivers

Management of Rivers is evolving.

a. Past concentration on protecting communities from flooding and erosion

b. Today. Community & Climate resilience - prioritises protection for communities but mahinga kai, biodiversity and recreation are central to our management

c. Climate Resilience programme

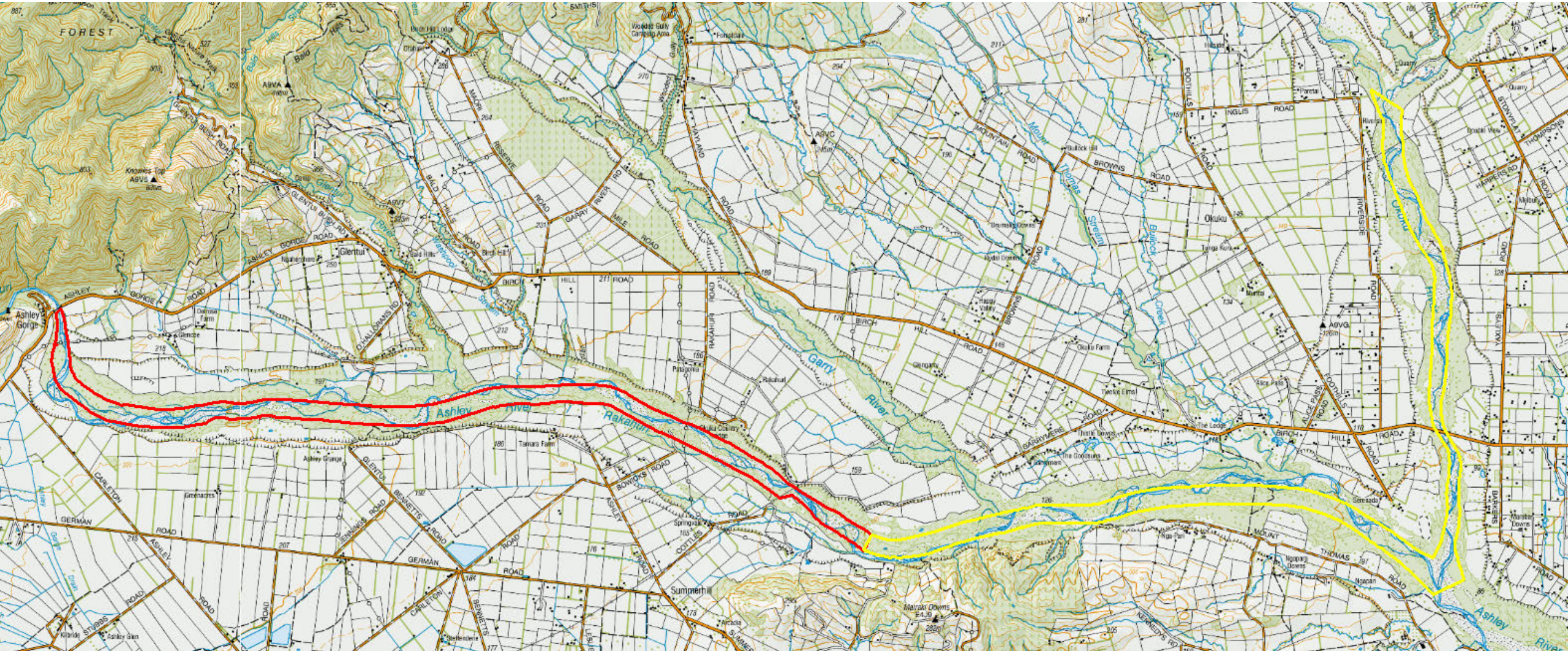
    1. Ashley /Rakahuri River Protection and Fairway Management
    2. Region wide Planting and Berm Transition
    3. RANGITATA 2019 FLOOD RECOVERY PROJECT Workstream 3. Natural Infrastructure Enhancements

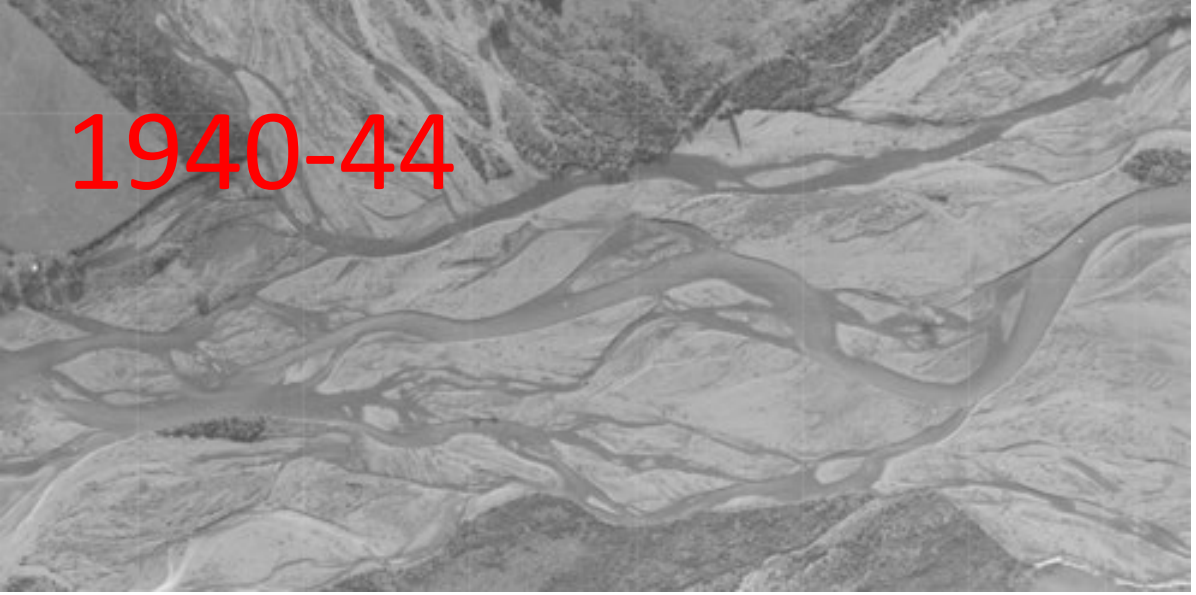
Ashley River/Rakahuri

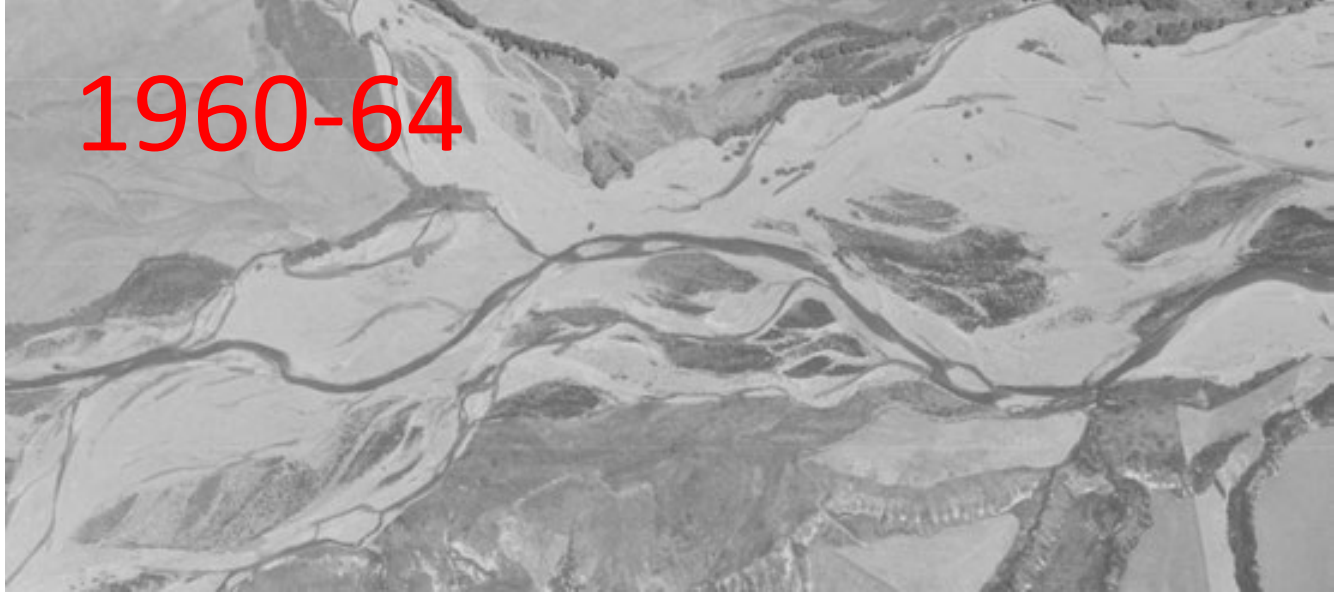
Protection and Fairway Management

-Vegetation Clearance

Ashley River/Rakahuri Protection and Fairway Management




1940-44


1960-64


1990-94


Latest

Regionwide Berm Transition Project

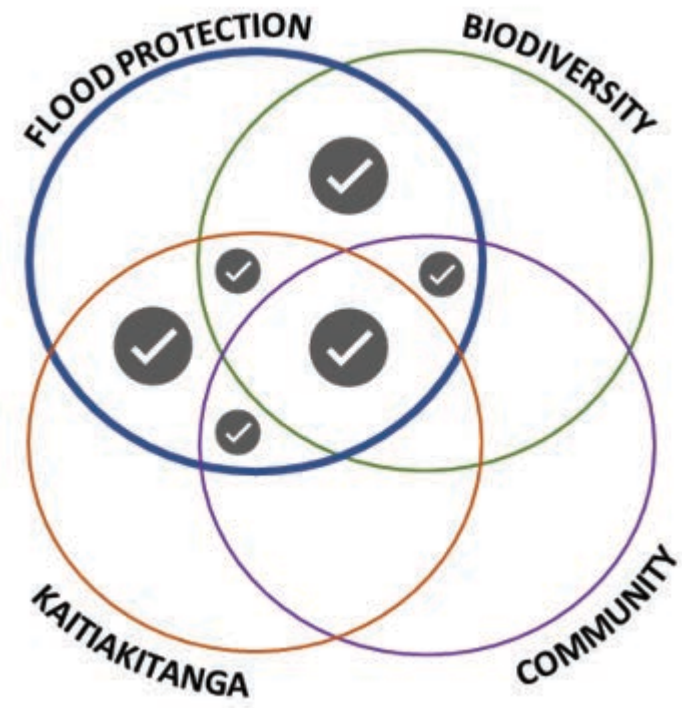
- Central government co-funded project for building resilience to flood events

- 3 year project (until Nov 2023)

- Transform Canterbury braided river berms by increasing their value, resilience and function

- 23 rivers ($45k - $1.3M budget per river)

- Rangitata a separate project with its own funding



Achieve Berm Transition Through

1. Targeted weed control

2. Under-canopy enhancement native planting

3. New mixed protection planting

4. Flood protection pole planting

5. Fairway clearance

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River rating districts (managed sections of river)

Three items for context, very briefly;

- Main types of work
- A history of river rating districts in Canterbury and relevant Acts and policy
- The scale of Environment Canterbury river “assets”, and the inertia of management

An explanation of the “fairway lines” used to guide vegetation clearance

Opportunities and challenges for relaxing constraints on rivers

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Ashley River / Rakahuri
Dalziels Rd

Fairway clearance

Managed – for willows and large scrub

Unmanaged

Planting

Anchored and tied trees

Rock – linear/groynes

	Some Relevant Acts	Purposes	Main River rating districts
1860's	*Canterbury Rivers Act*	*....to provide for the making repairing and maintaining of protective works to lessen the damage occasioned by the overflow of such Rivers*	
1900's	River Boards Act	All rivers, streams, and watercourses within any river district … for the construction or maintenance of any works necessary to prevent or lessen any damage which may be occasioned by the overflow or the breaking of the banks of the same.	*South Waimakariri* Rangitata *Upper Orari*
1920's	Waimakariri River Improvement Act Ashley River Improvement Act	The Trust shall have full power to do all such things… necessary to effectively cope with the drainage and the flooding of the district.	Waimakariri Ashley
1930's			Lower Ashburton
1940's	Soil Conservation and Rivers Control Act	It shall be a function of every Catchment Board to minimise and prevent damage within its district by floods and erosion.	Selwyn Lower Hinds Opihi
1950's			Kaikoura Orari-Waihi-Temuka Pareora Lower Waitaki

	Some Relevant Acts and policy	Purposes/intended outcomes/outcomes	Main River rating districts
1960's	*Water and Soil Conservation Act*	*An Act …[for] conservation, allocation, use, and quality of natural water, and for promoting soil conservation and preventing damage by flood and erosion, …and promoting multiple uses of natural water and the drainage of land, and [to allow] for …the needs of [primary and secondary industry, water supply, fisheries, wildlife habitats, recreation]*	Upper Hinds Lower Waihao +major upgrades
1970's			Upper Ashburton
1980's	*Removal of Govt subsidy of works*	*Result: reduction in some of the more constraining interventions, focus on maintenance and affordability*	Lower Rakaia
1990's	Resource Management Act *General rate ~30%*	Sustainable management of natural and physical resources… [including] while safeguarding the life-supporting capacity of air, water, soil, and ecosystems;…	Several localised ones such as Waiau Town
2010's	Canterbury Water Management Strategy	From 2010, maintaining the extent of active floodplains, flow variability and sediment flow processes including when undertaking river protection works, land-use change or deliberate vegetation stabilisation By 2020, improve braided river nesting habitat By 2040, Canterbury's braided rivers show the dynamic, braided nature typical of such rivers	
2020's	*Natural and built environment*		

Scale of river scheme works on braided rivers

Environment Canterbury assets	Length	Replacement cost
Erosion protection buffers and rockwork	1600km	$310m
Stopbanks and groynes	660km	$300m

…and why they are difficult to change…

- Decades of investment, previously but no longer supported by government funding
- Private landowners want to keep being protected and have a say in spending priorities (since they pay most of the cost)
- Retreat would often involve compensation for or purchase of private land – ratepayers likely to be reluctant to pay
- Individual instances of erosion repair need to align with remaining buffer or other assets

Examples of relaxing widths

Kowhai River

- Rock lines were constructed to a theoretical form (120m wide) but often washed out.
- In 1987, a decision was made not to reinstate them on the same alignment
- In 2000, a target width of 200m was formalised
- We now have a 200m wide cleared fairway upstream of the Railway (most of the river)

Kowhai ~1985

Kowhai ~1995

Kowhai ~2013

Lower Opihi River

- Fairway lines were drawn up on several South Canterbury rivers in (or prior to) the 1980's. Buffers were planted to the edge of the fairway.
- After the large 1986 flood, the 175m fairway was recognised as too narrow but the buffers in front of stopbanks needed to be preserved.
- An ideal width was said to be 300m, with a 100m wide buffer
- The 300m width with a 100m buffer is not achievable without shifting the stopbanks
- About 1km of the most vulnerable stopbanks have been shifted
- We're still using the 175m fairway to guide clearance – but no longer plant up to them unless the buffer is too narrow.

Opihi ~1935

Opihi ~1965

Opihi ~1975

Opihi ~1995

Opihi ~2018

River width theory

- Developed in very different circumstances to braided rivers (steady flow in sand bed canals) so we know they're not directly applicable
- Various combinations of parameters for equations to estimate a stable river width
- One of the older, better known, simpler ones is the Lacey formula, which states that a stable river width is related directly to:
  - Sediment size
  - Flow rate (mean annual flood)
  - River slope

Practice

- Calculated Lacey widths
- Compared to widths from aerial photos over a long period of time (decades) to capture variation in meander widths
- Chosen a width that is:
  - a little larger than the average width that the larger meanders spread from a series of photos
  - consistent along a reach with the same slope and no tributary inflows

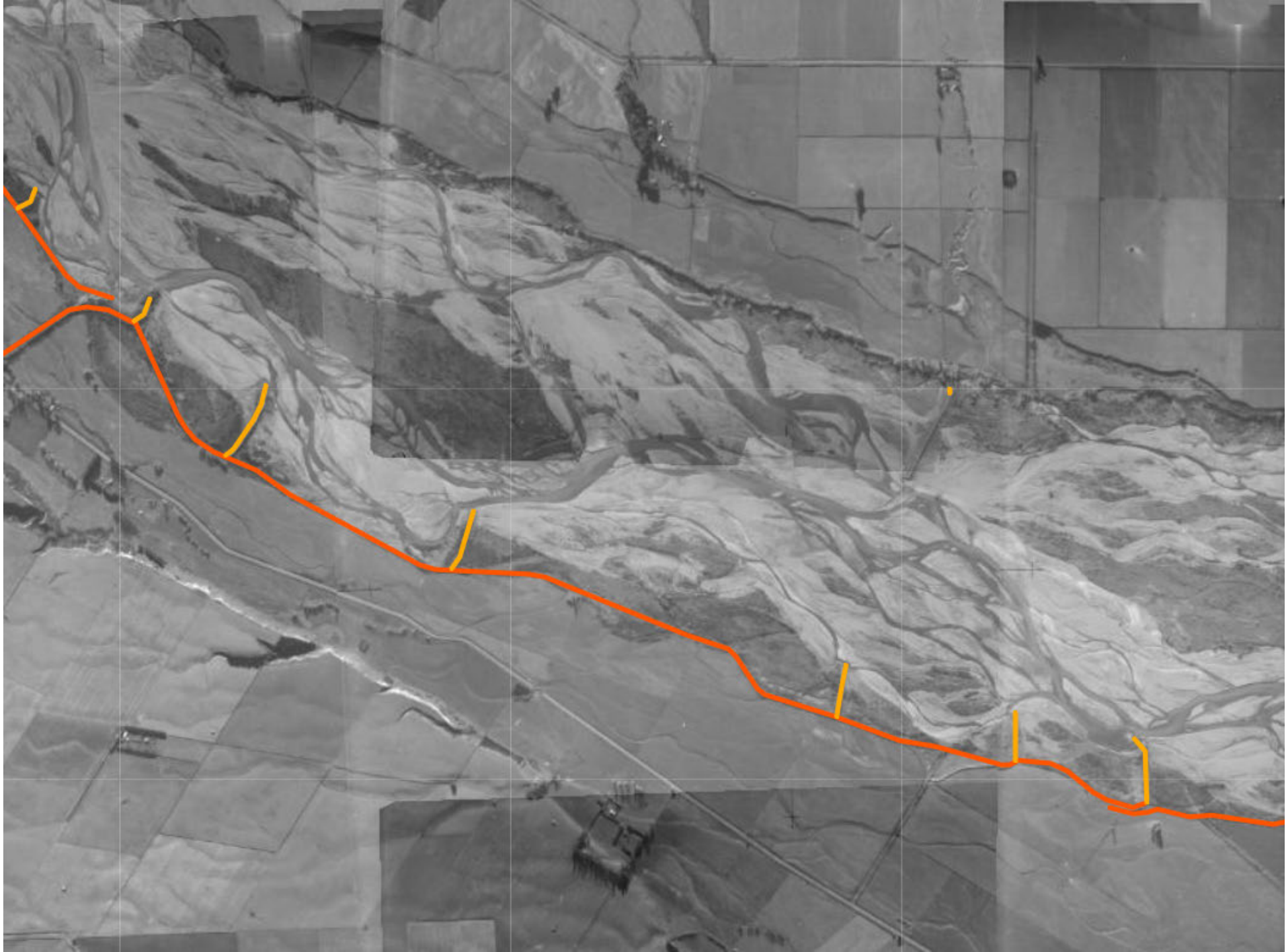
Found that for braided rivers, the chosen widths varied from 1 to 6 times the Lacey width, corresponding generally to:

	No of braids	Lacey width ratio	Examples
Narrow rivers	1-2	1-1.8	Hinds/Hekeao, lower North Branch Ashburton/Hakatere
Larger foothills rivers	2-3	2-3.2	Ashley/Rakahuri u/s Rangiora, Orari u/s Railway
Alpine rivers	4+	4-6	Waimakariri, Rakaia, Rangitata, Waiau Uwha

Examples

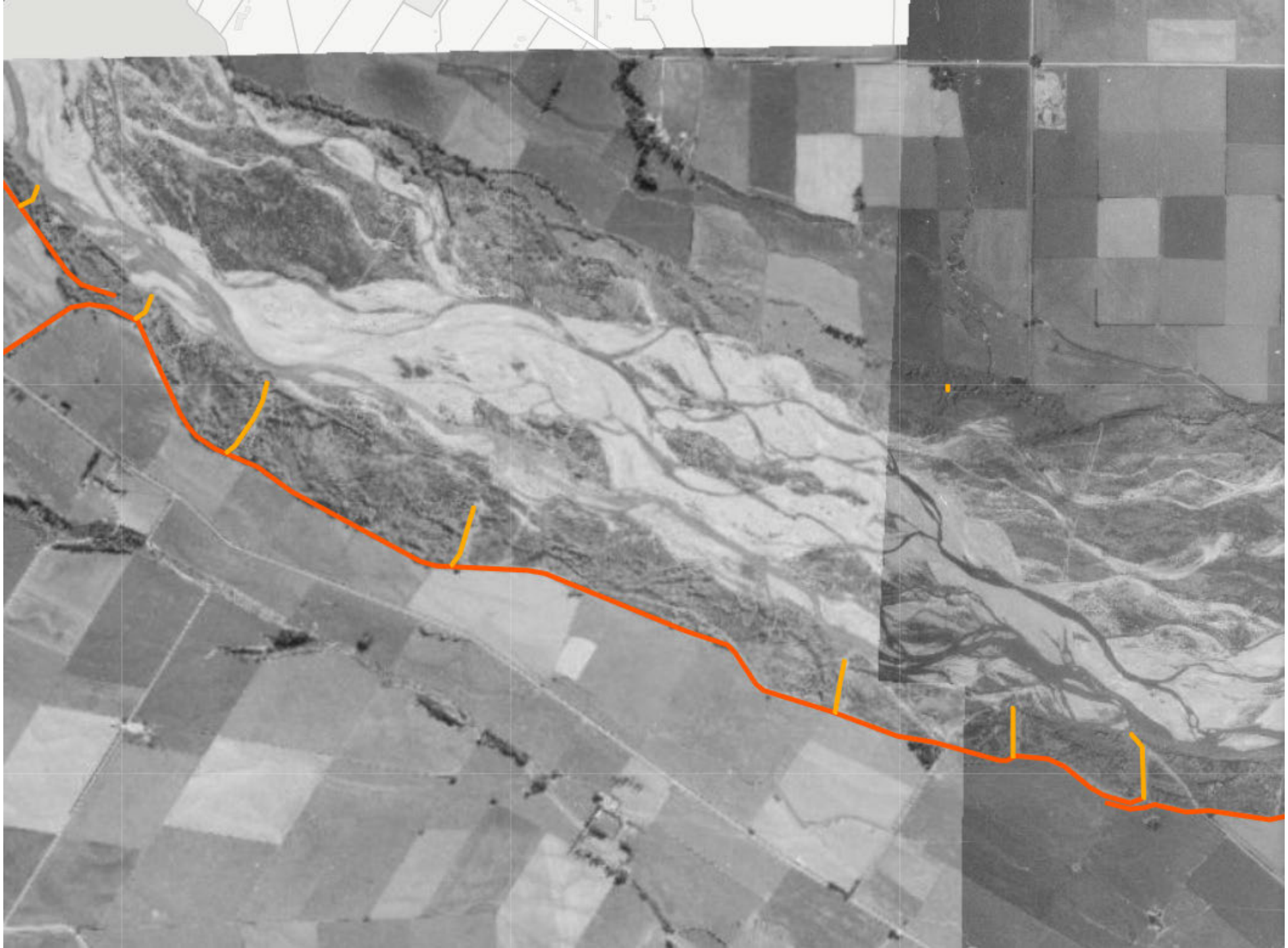
- Ashley / Rakahuri
- Selwyn / Waikirikiri

Ashley/
Rakahuri
~1940



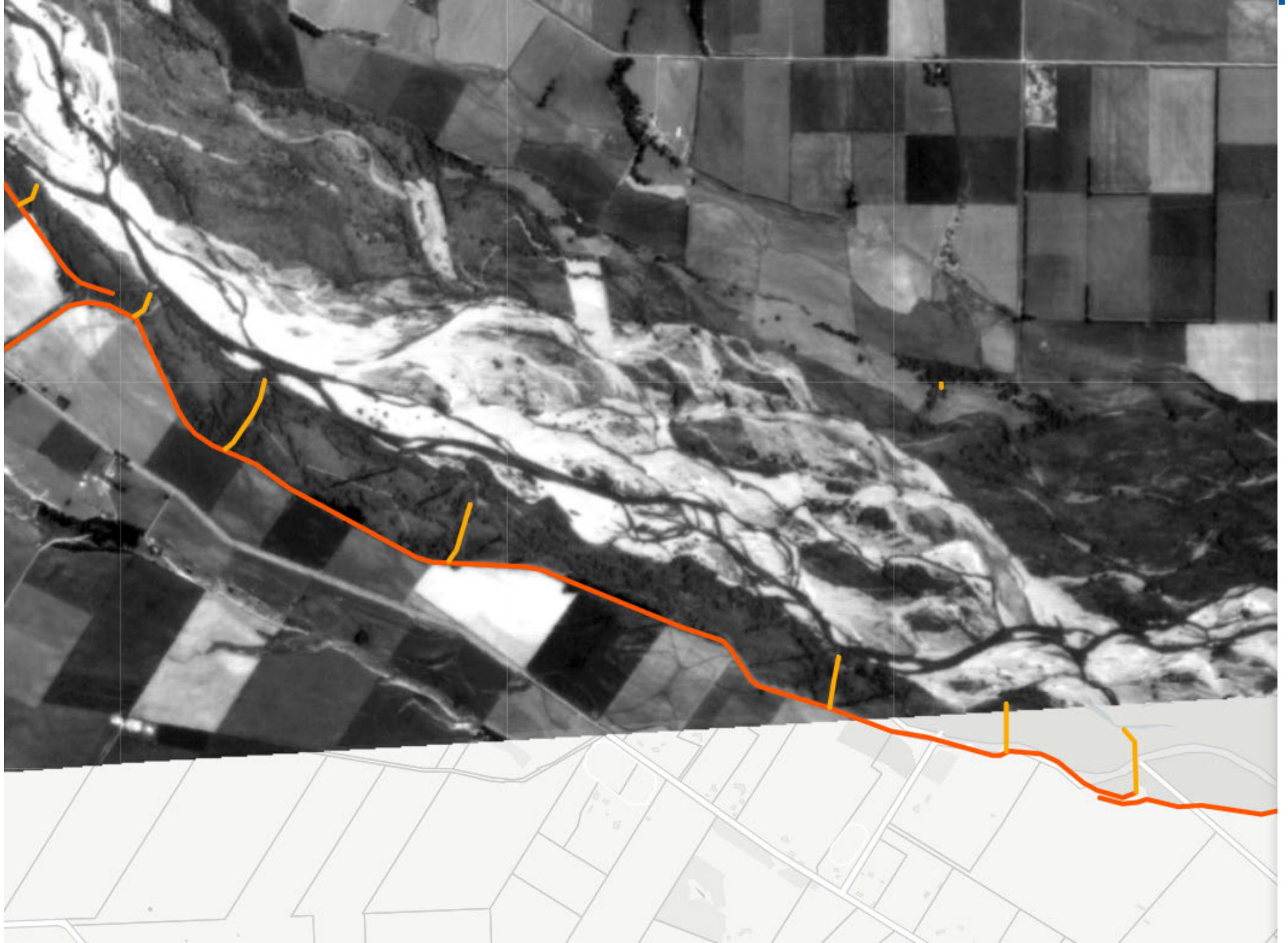
Ashley/
Rakahuri
~1965

Ashley/
Rakahuri
~1975



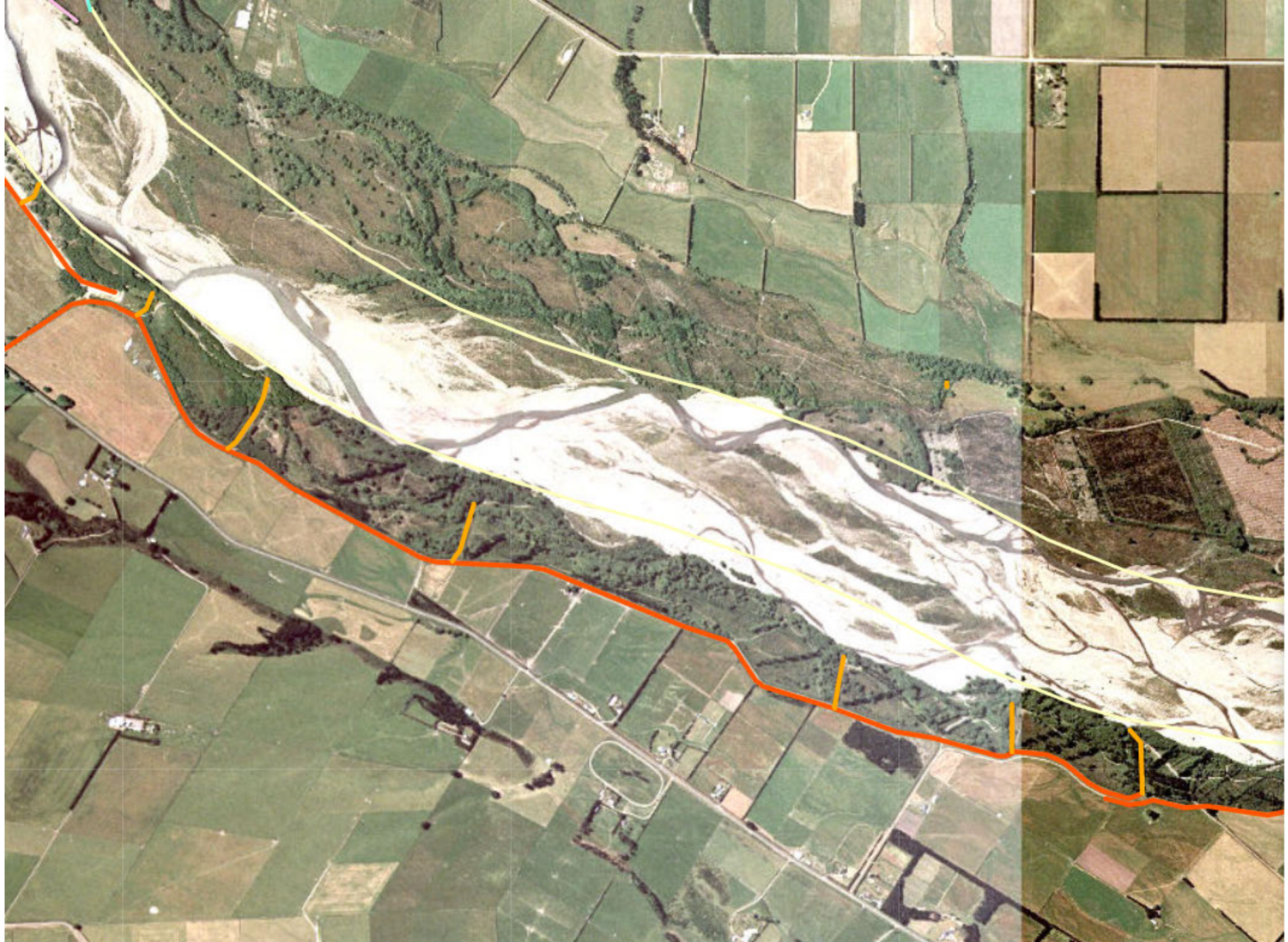
Ashley/
Rakahuri
~1980

Ashley/
Rakahuri
~1985



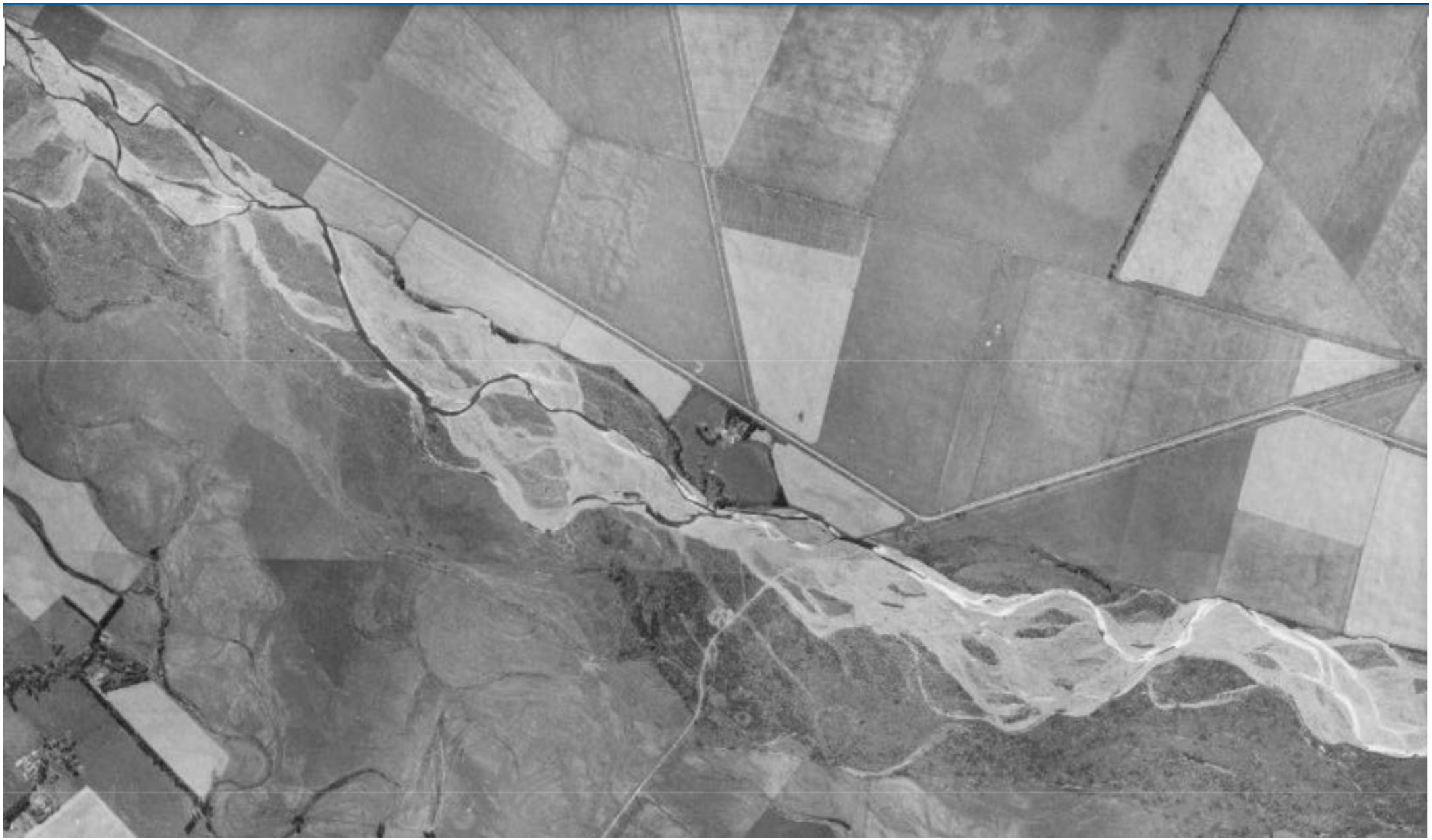
Ashley/
Rakahuri
~1995

Ashley/
Rakahuri
~2000

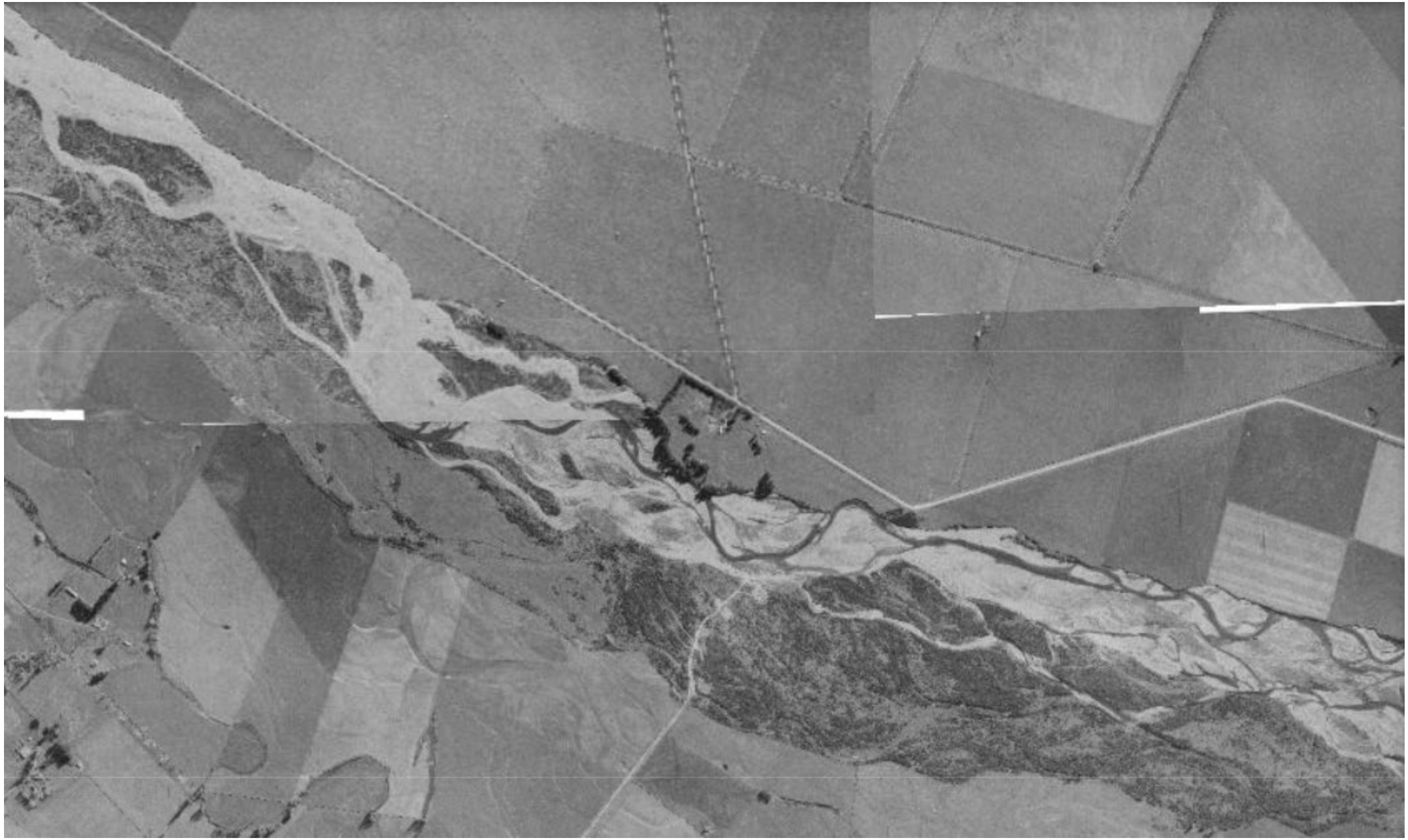


Ashley/
Rakahuri
~2018

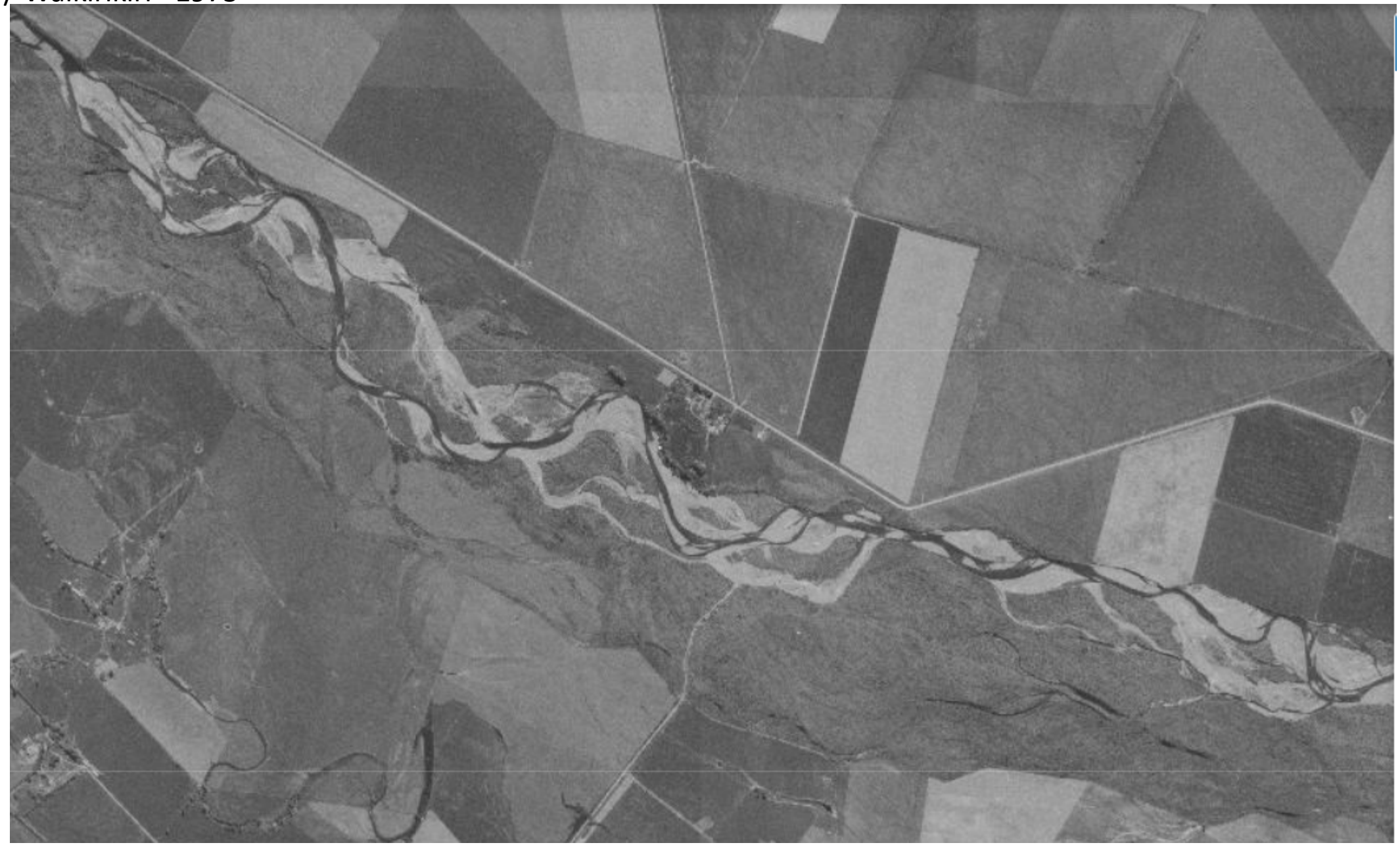
Selwyn / Waikirikiri ~1940



Selwyn / Waikirikiri ~1960



Selwyn / Waikirikiri ~1975



Selwyn / Waikirikiri ~1985

Selwyn / Waikirikiri ~1995

Selwyn / Waikirikiri ~2013

Selwyn / Waikirikiri ~2018

South Branch
Ashburton River
~2018

South Branch
Ashburton River
June 2021

Opportunities and challenges for relaxing constraints

Large floods	"No mans land"	Funding sources influence decisions	Rating district objectives are rarely reviewed
• cause erosion and give a chance to reassess fairway widths and planting lines • but need to have a lot of erosion to realign • minor localised erosion tends to be repaired in line with remaining buffers • reduced buffer width means loss of resilience for the long term	• areas of berm between cleared fairways and planted buffers • very wide buffers with scattered trees can be just as resistant to erosion with a narrower denser buffer	• the existing rating district set up means those that benefit from protection the most pay the most • there's a general expectation of ongoing protection of private property • rating districts are set up for the long term and pay for ongoing maintenance of previous investment	• most of our funding is earmarked to maintain what we have and focussed on flood and erosion outcomes • scheme reviews are programmed at 1-2 per year so it will take a decade to get round our major schemes

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