New techniques
For quantifying patch dynamics in rivers to support baseline monitoring

Josh Latterell

"...habitat evolves through natural and anthropogenic processes, and patterns of change may be as important as any other habitat attribute"

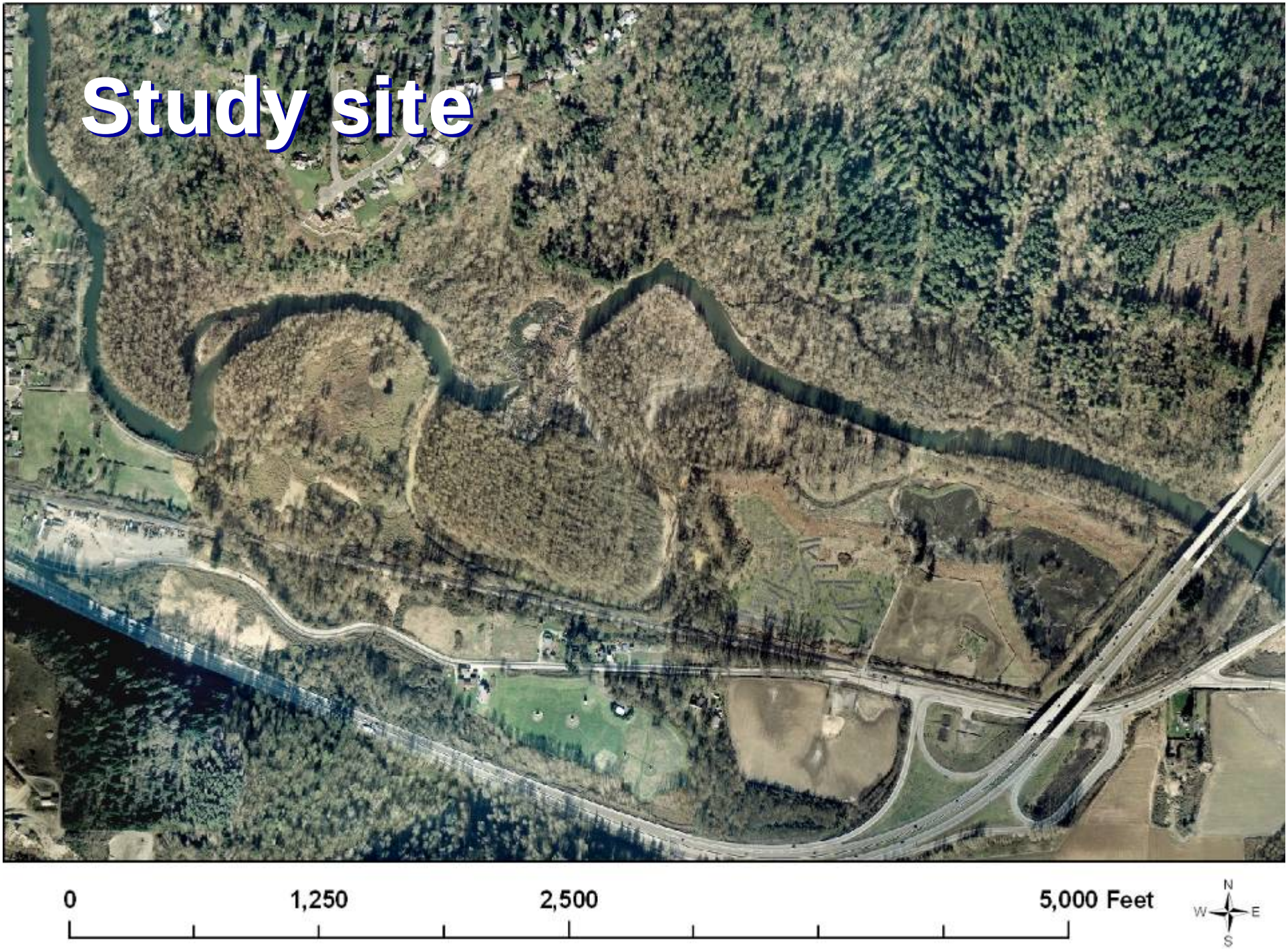
-Naiman and Latterell 2005

Baseline monitoring

- Goal
  - Characterize existing ecological conditions for future comparisons (effectiveness monitoring)
- Two time periods
  - Pre-impact
  - Post impact
  - (Restored)
- Scale
  - Segment (20-30 x channel width)

0 1,250 2,500 5,000 Feet

N W E S


Study site
0
1,250
2,500
5,000 Feet
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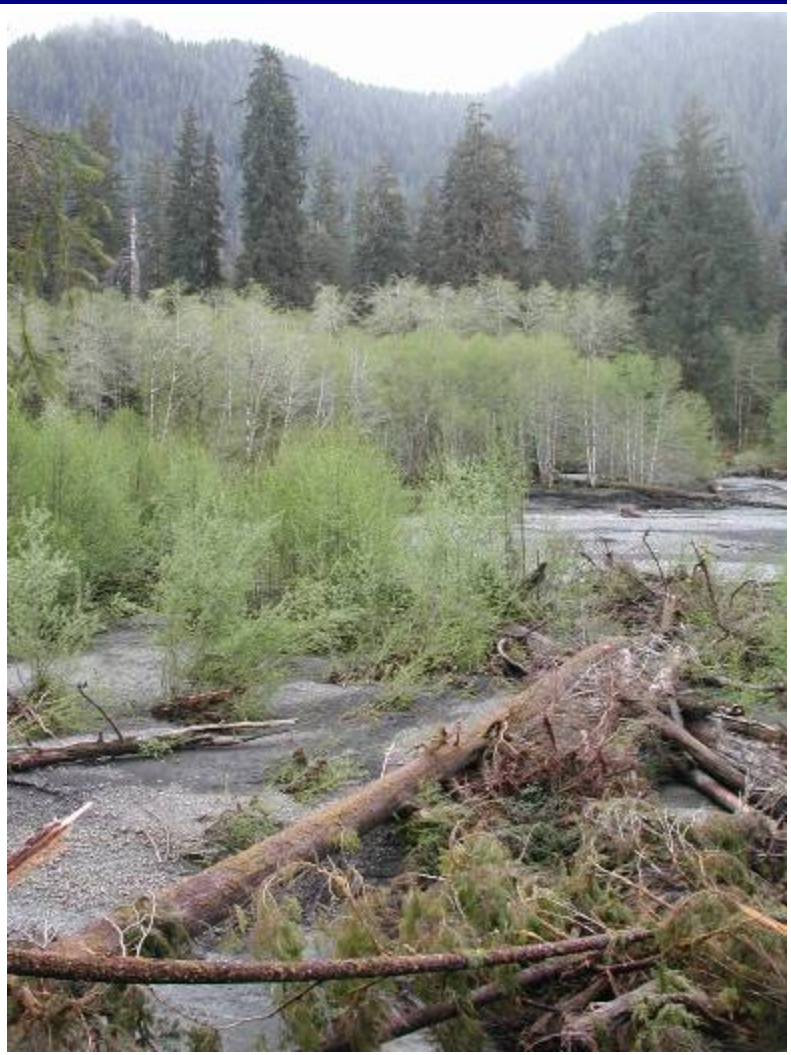
Patch turnover

- Dynamic patch mosaic
- Transfers important materials
- Driven by channel migration, succession



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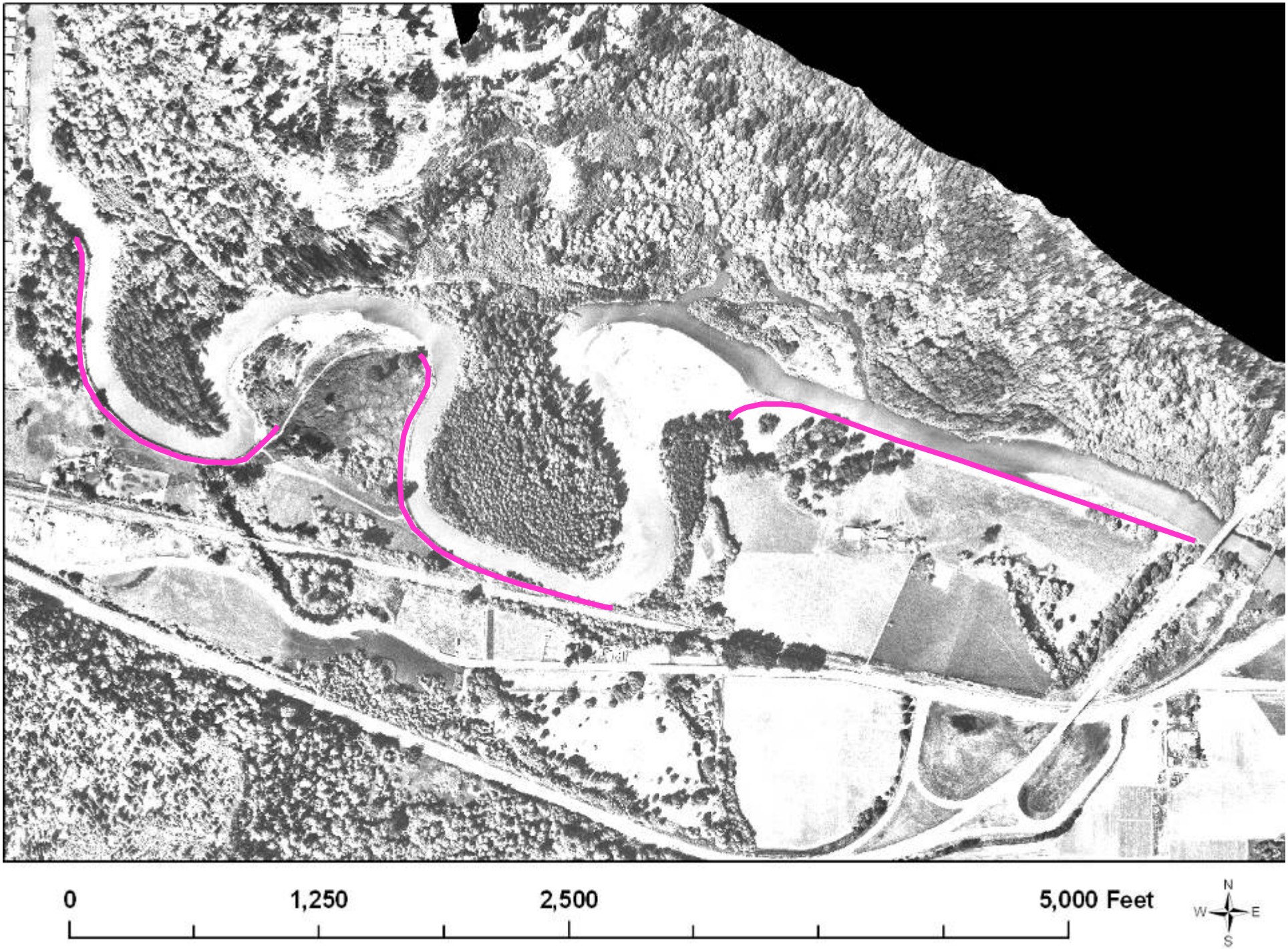
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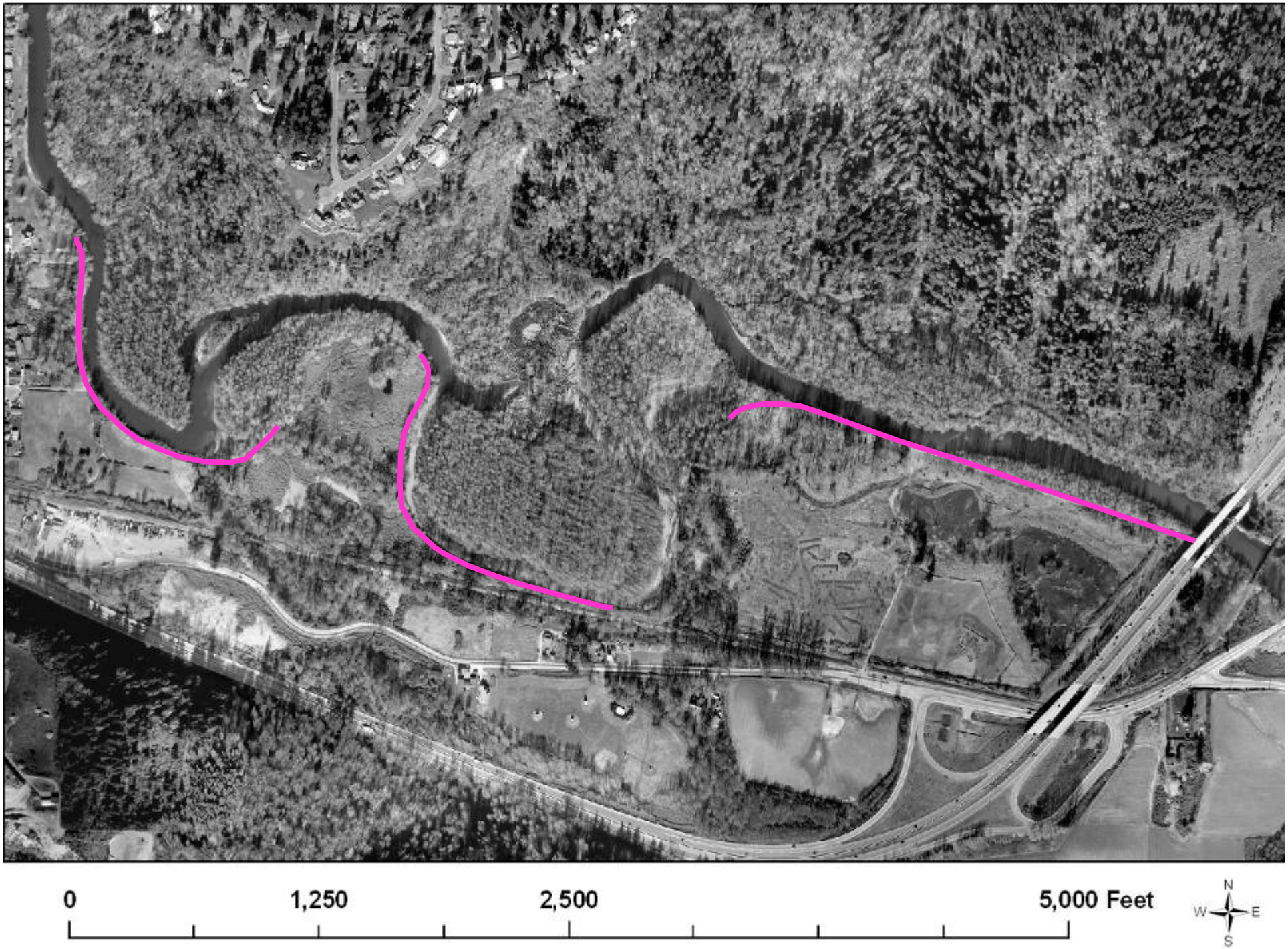
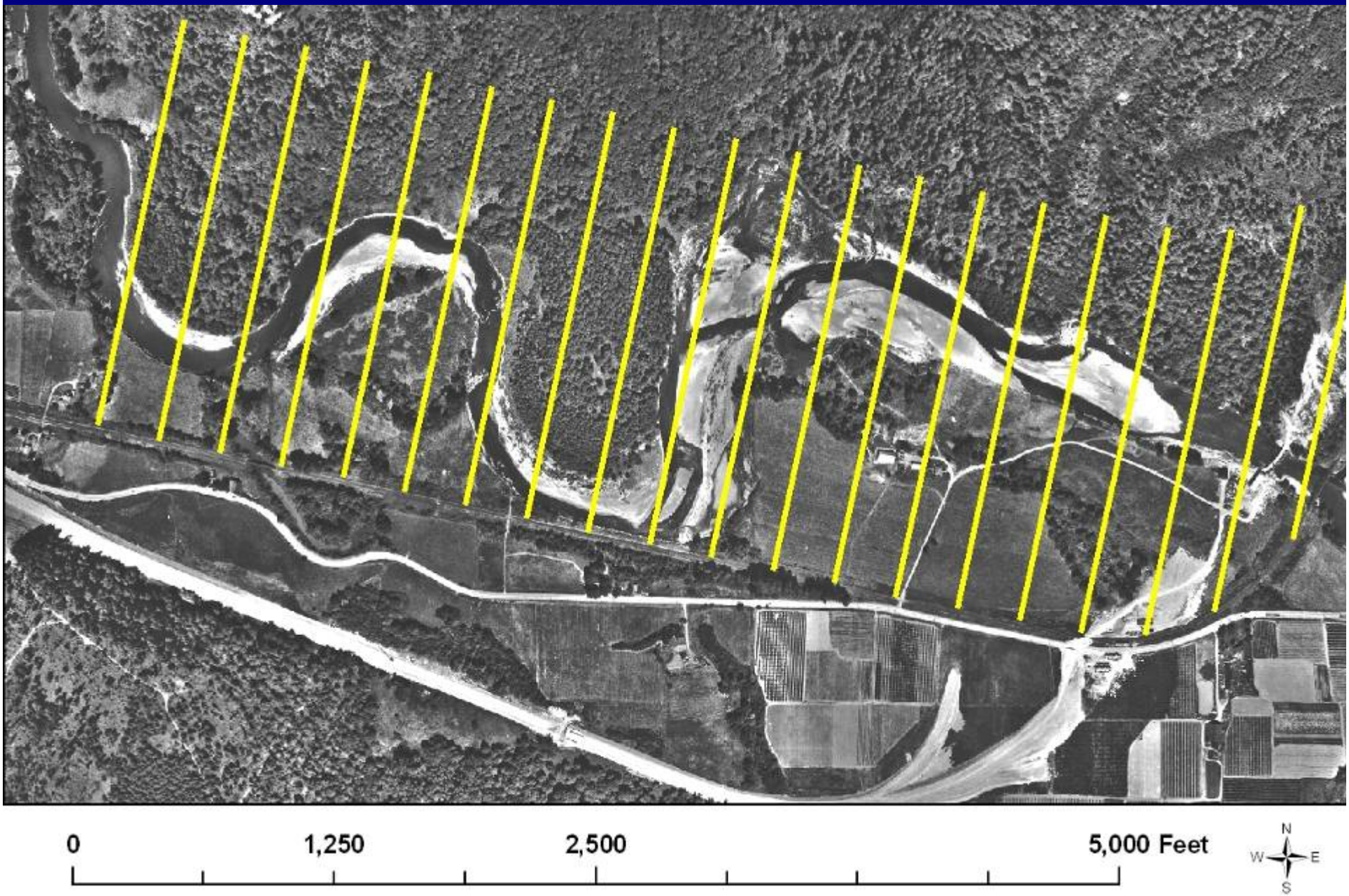

0
1,250
2,500
5,000 Feet
N
W
E
S

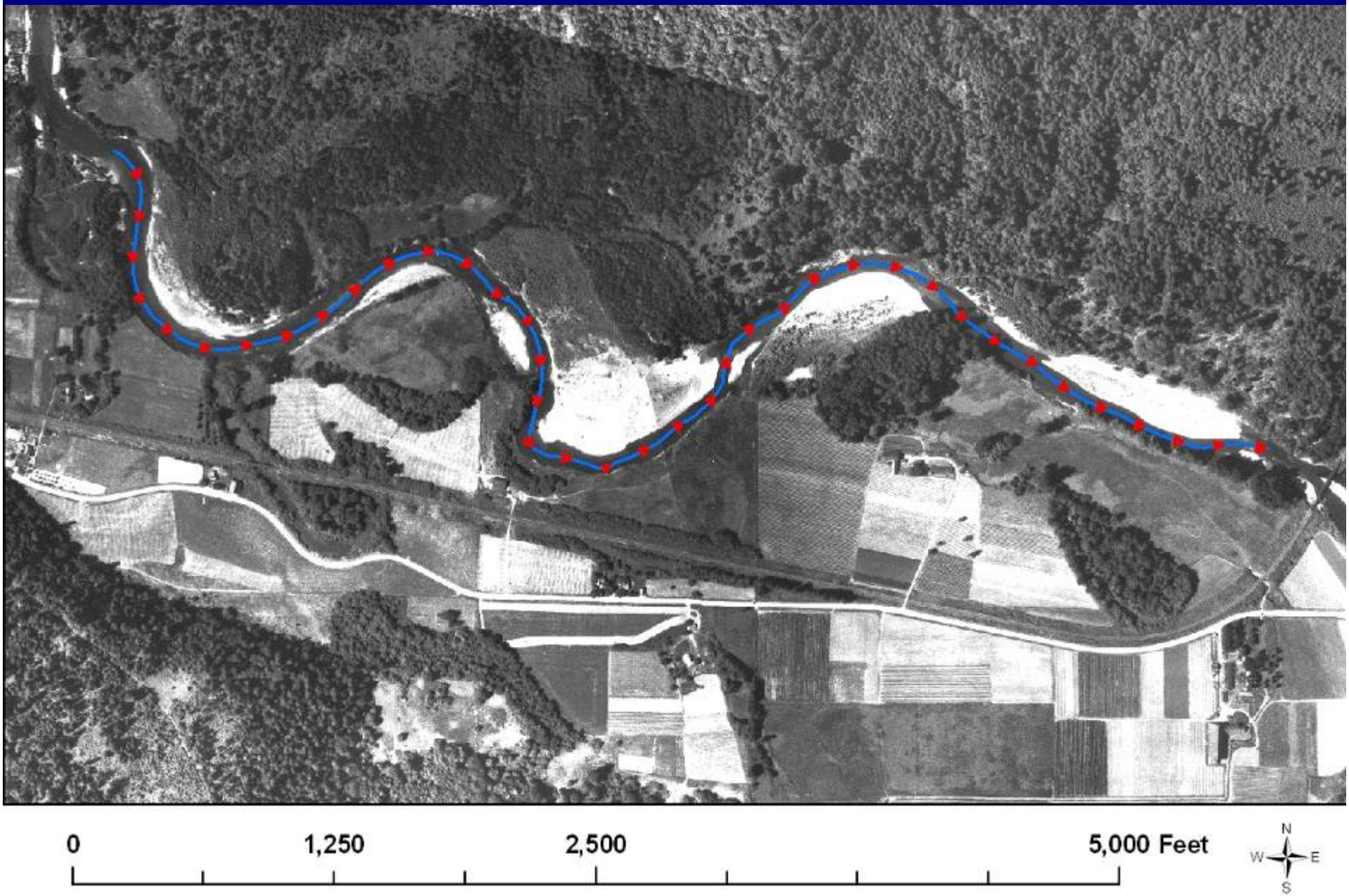
Methods

- Airphotos
  - 4 pre-impact
  - 4 post-impact
- Channel migration:
  - Sequential centerline differencing (SCD)
- Patch dynamics:
  - Cumulative erosion rate (CER)

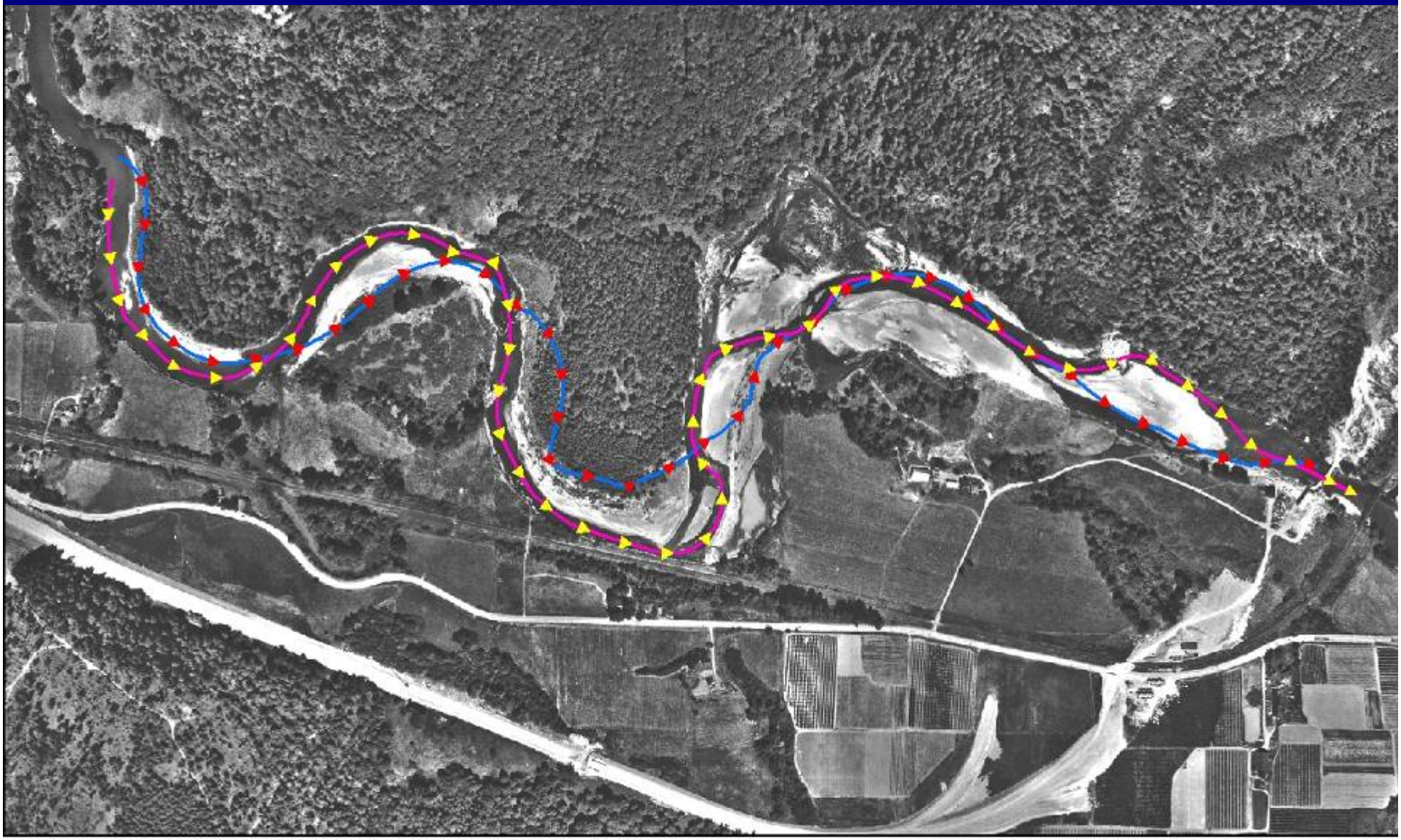
SCD Technique: 1. Establish belt transects (300 ft)



2. Delineate and subdivide initial channel centerline



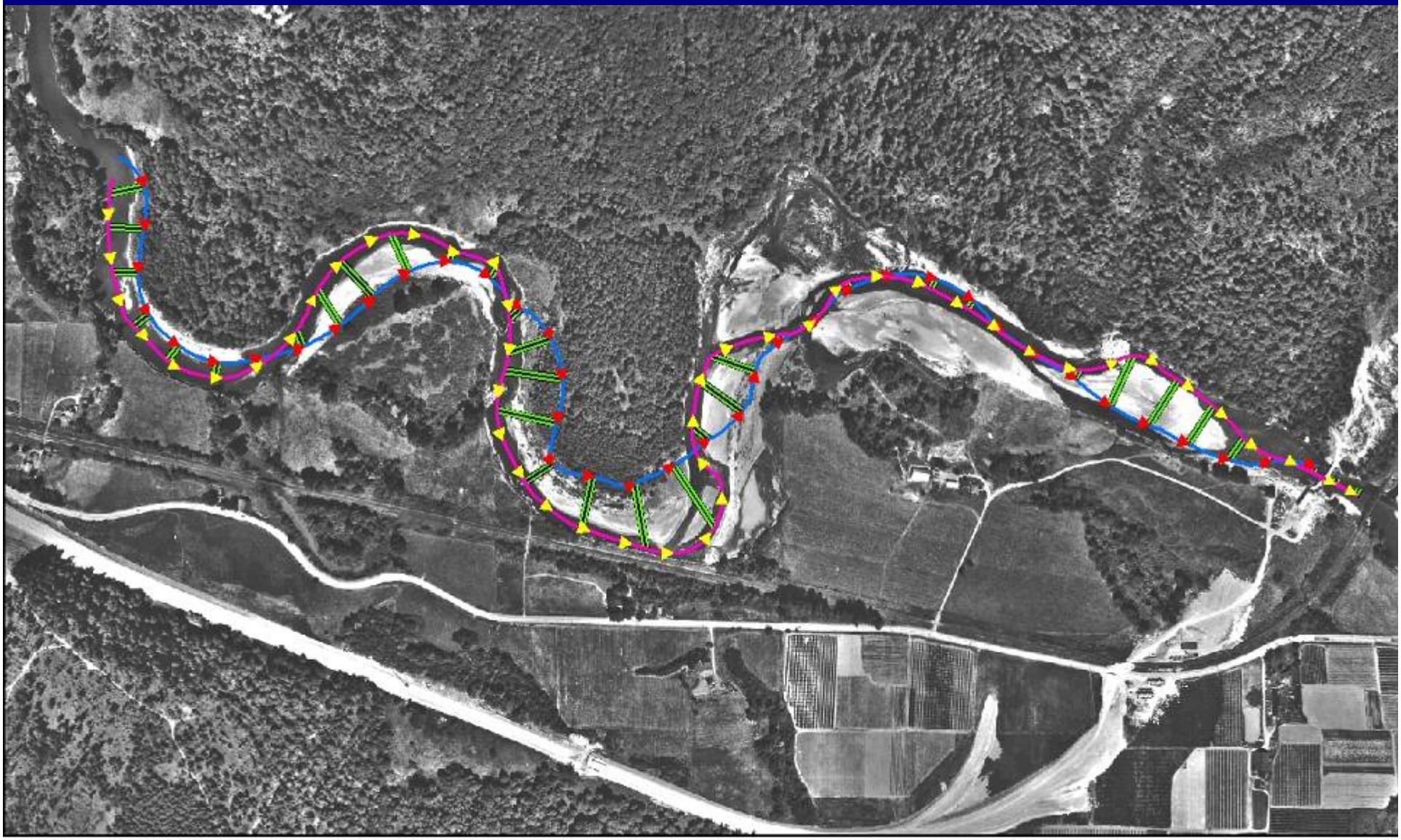
3. Delineate and subdivide next channel centerline



0 1,250 2,500 5,000 Feet

N W E S

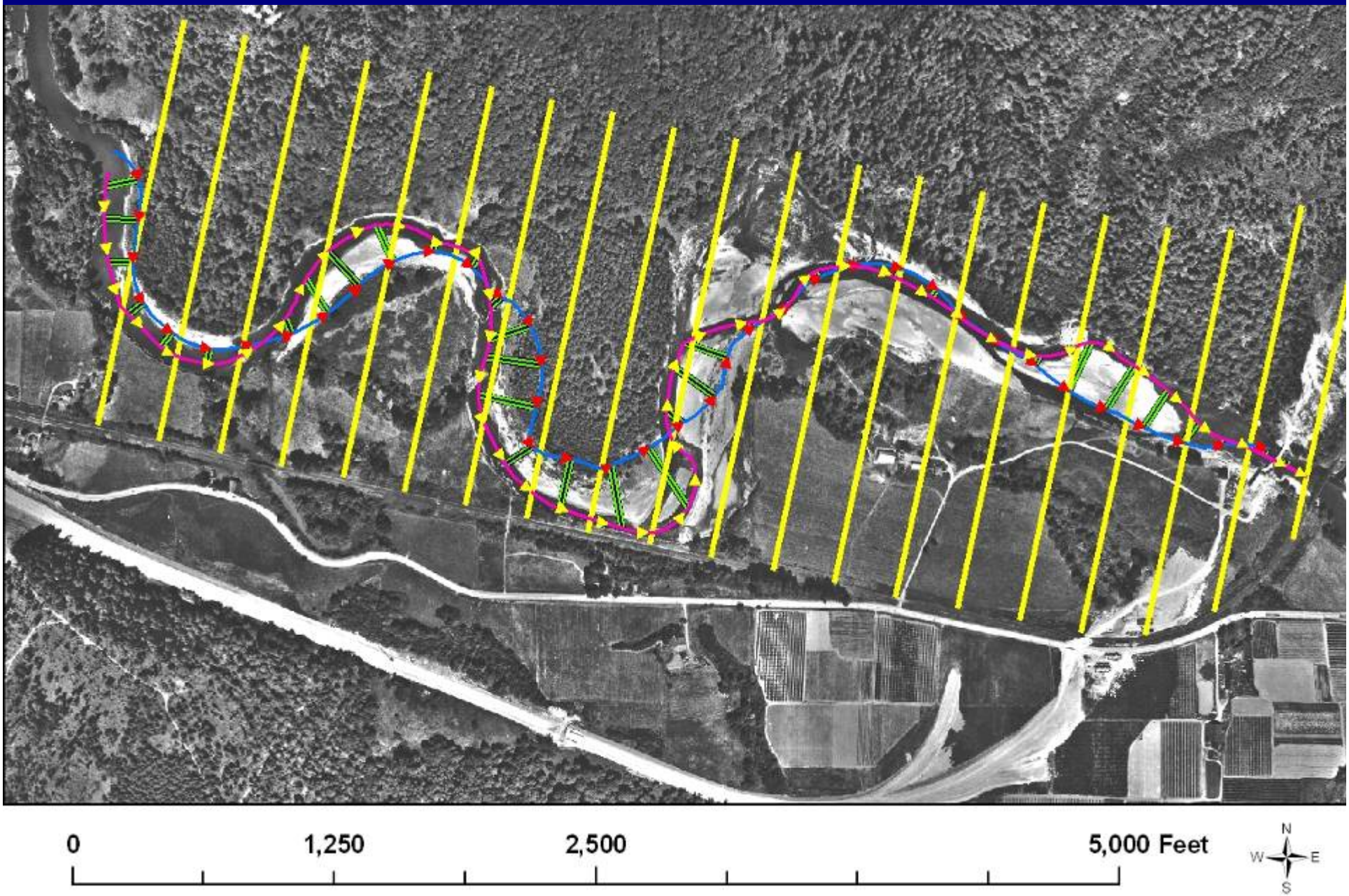
4. Quantify distance, mechanism, and direction of change



0 1,250 2,500 5,000 Feet

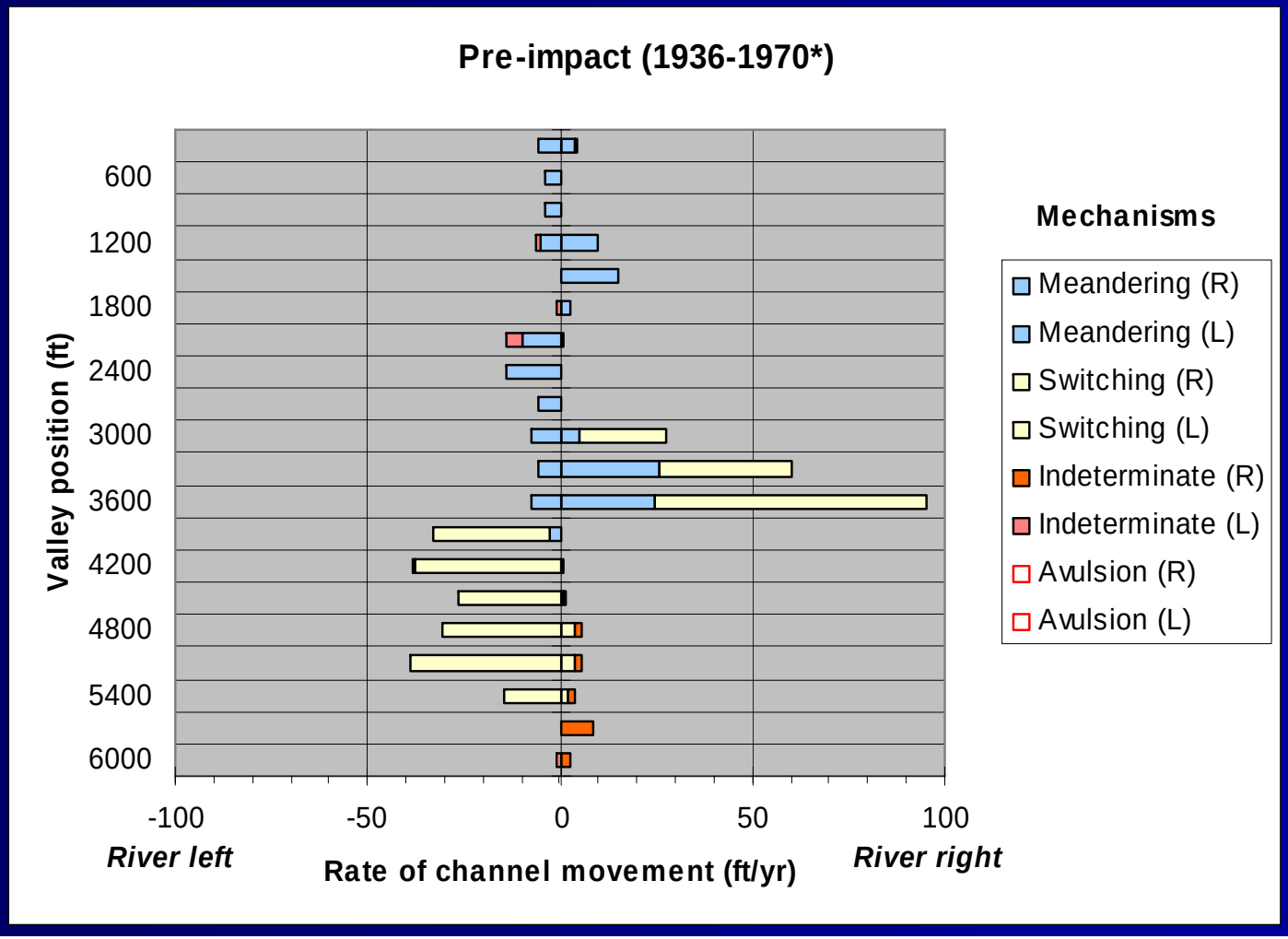
N W E S

5. Calculate average in each belt transect

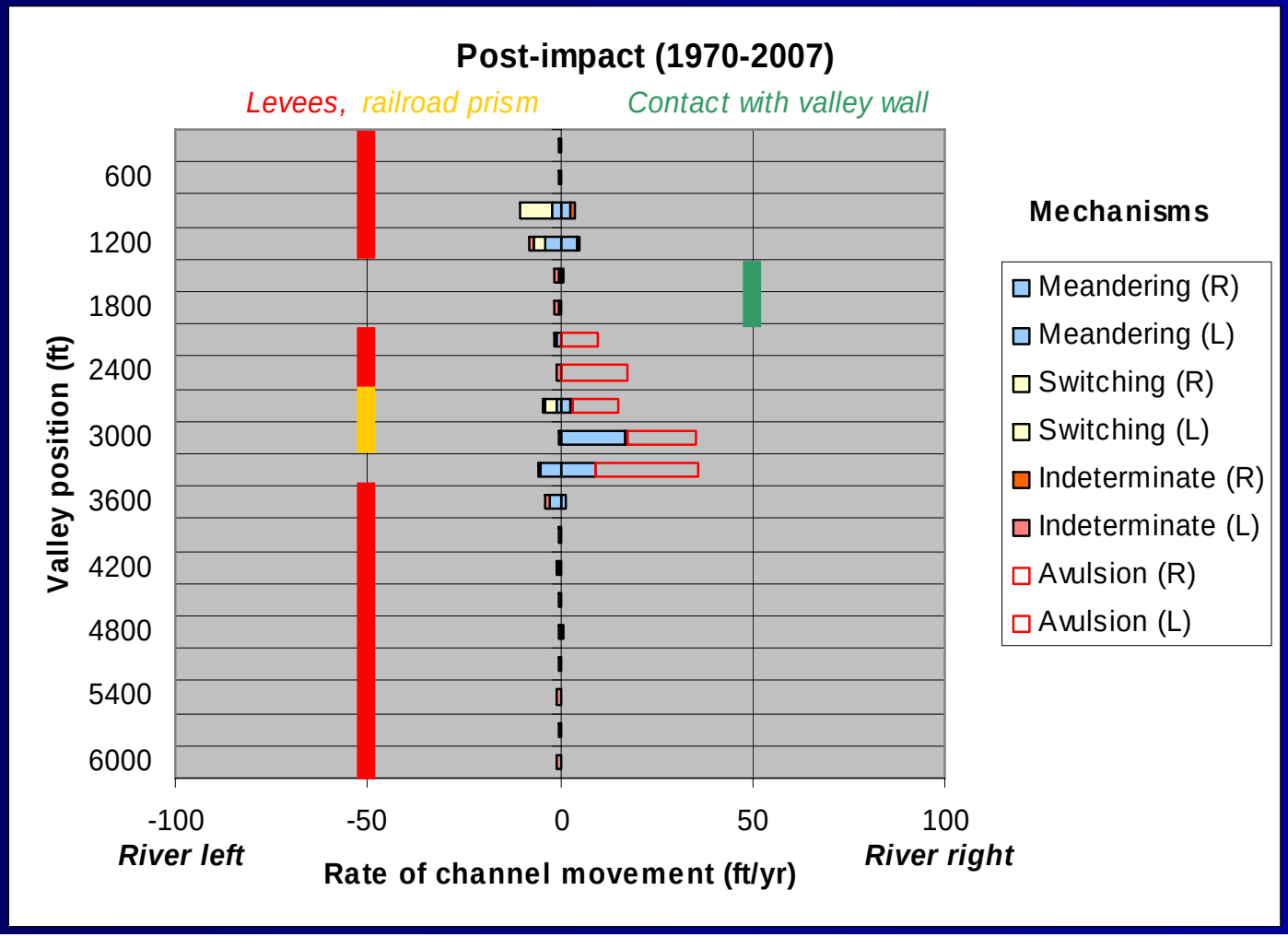


6. Repeat for sequential channel positions, average over all intervals

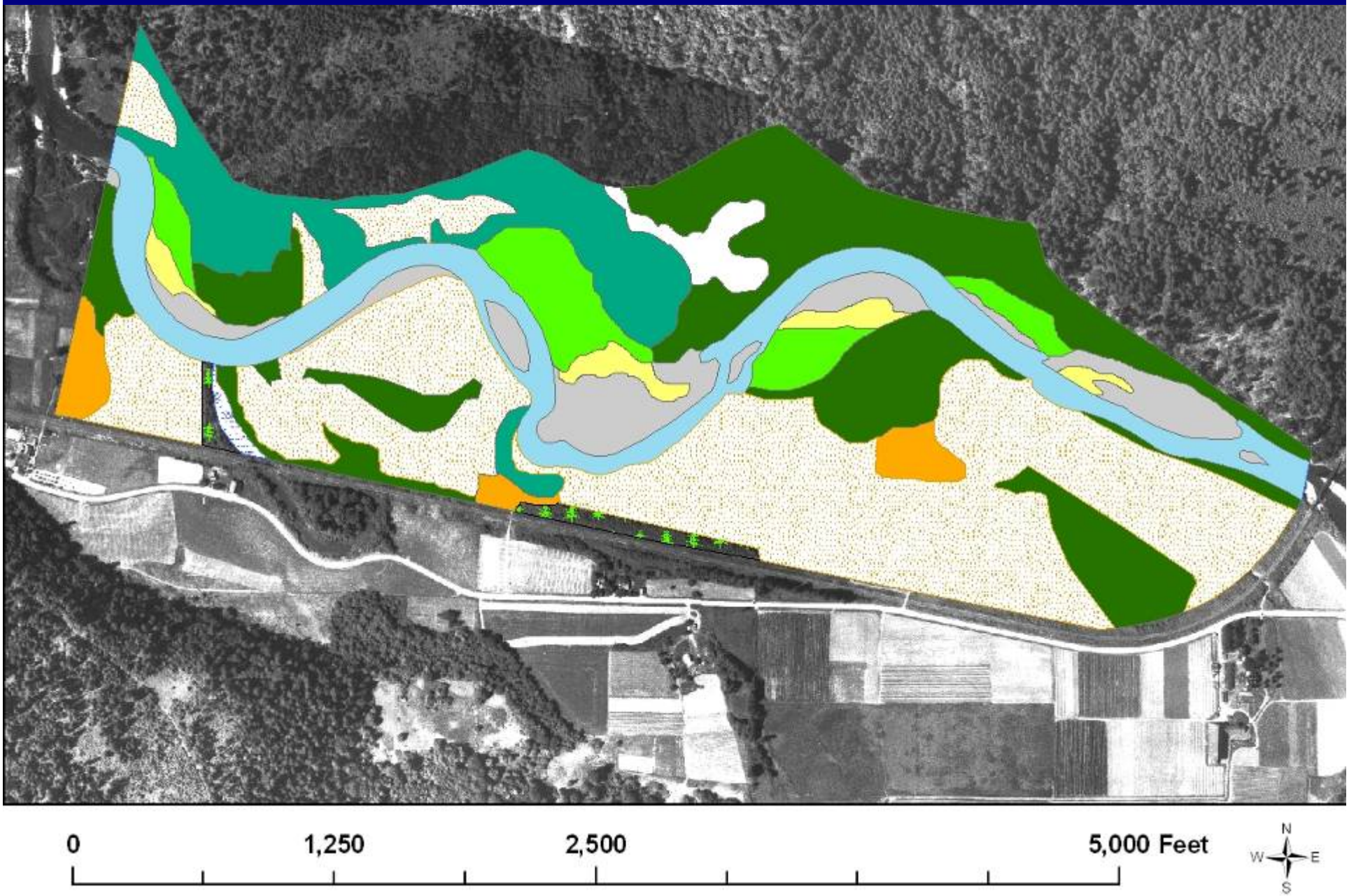
Results - Pre-impact



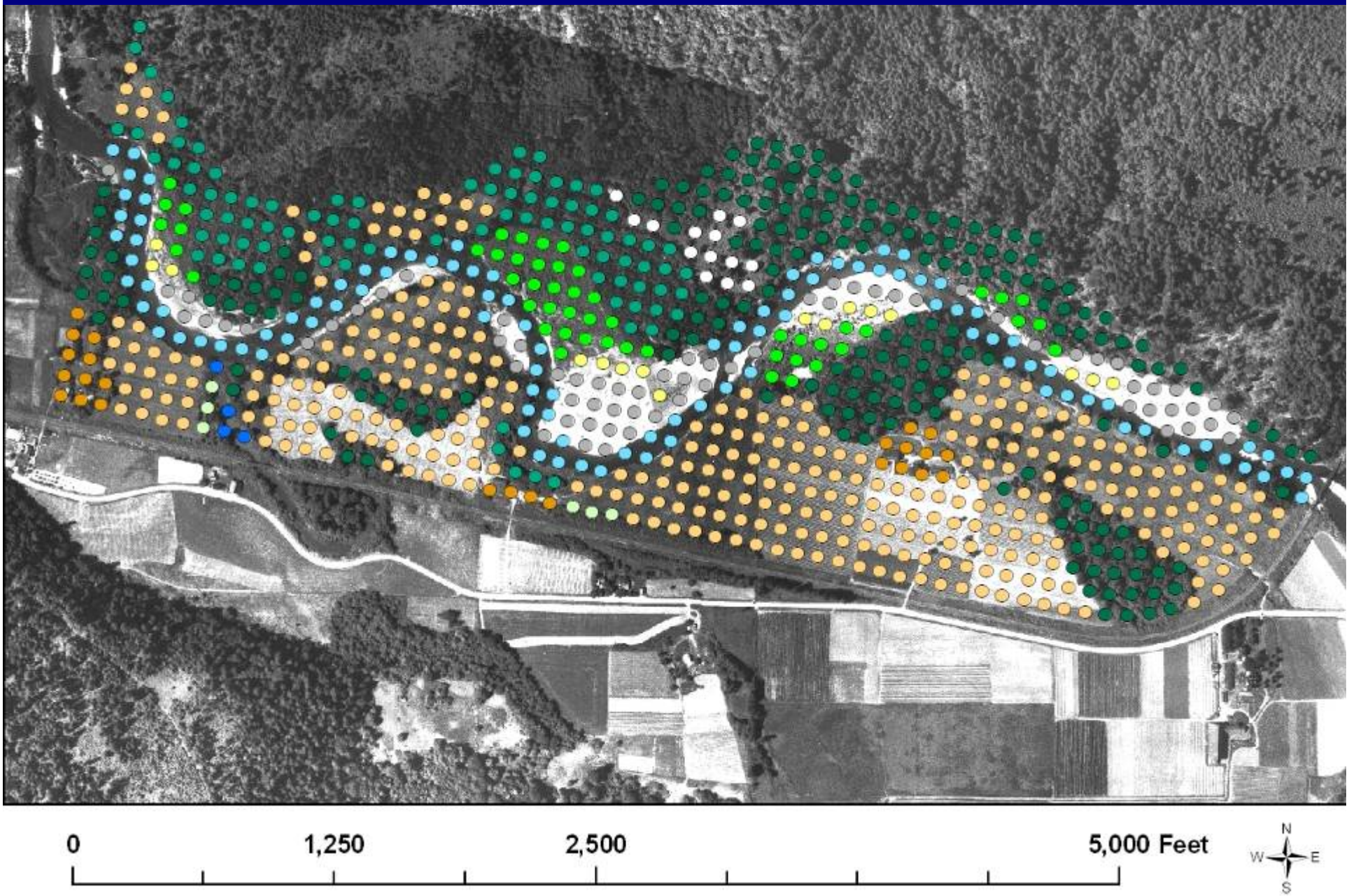
Results - Post Impact



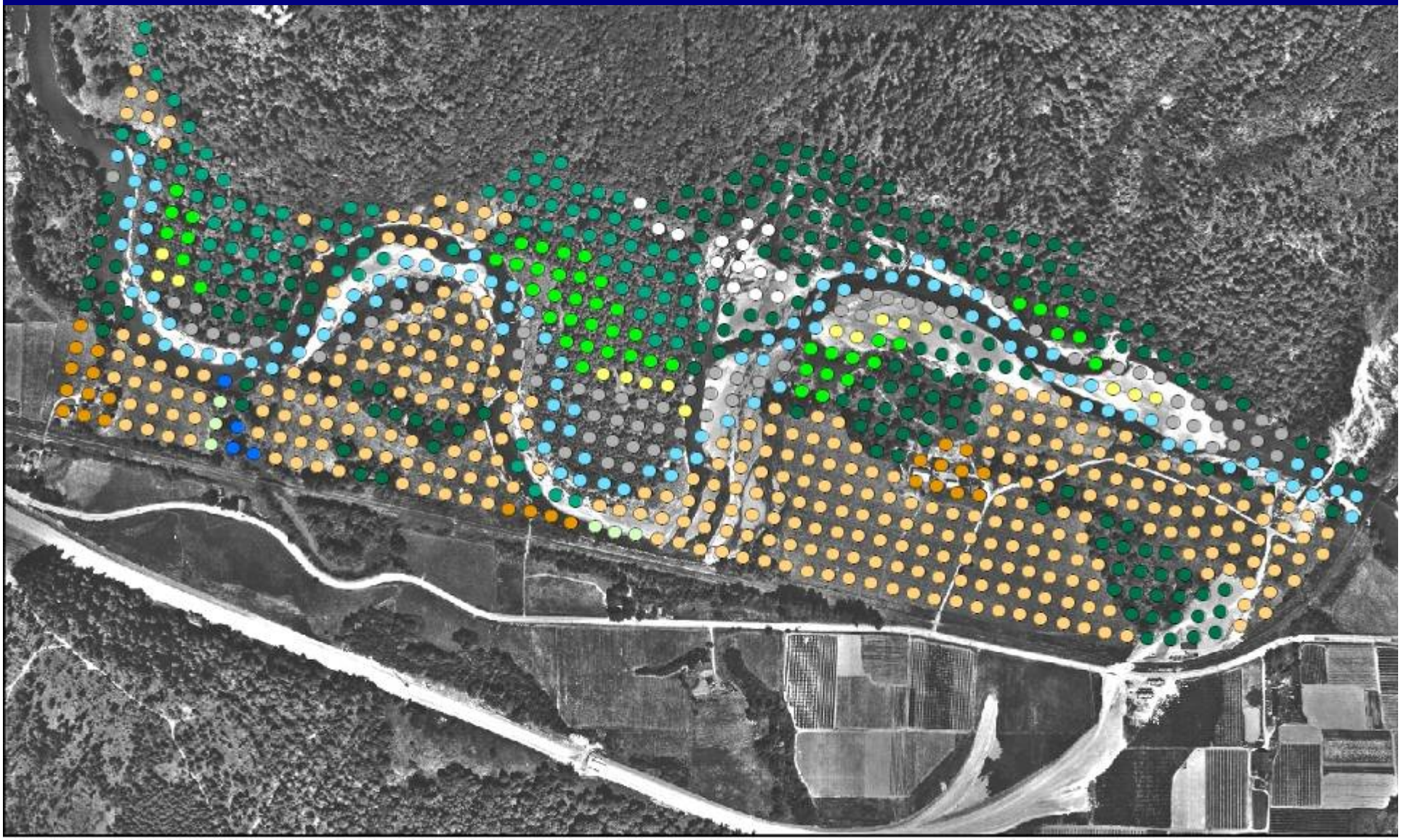
Patch Erosion Rates: 1. Classify *initial* landcover



2. Establish PRE-IMPACT sampling points



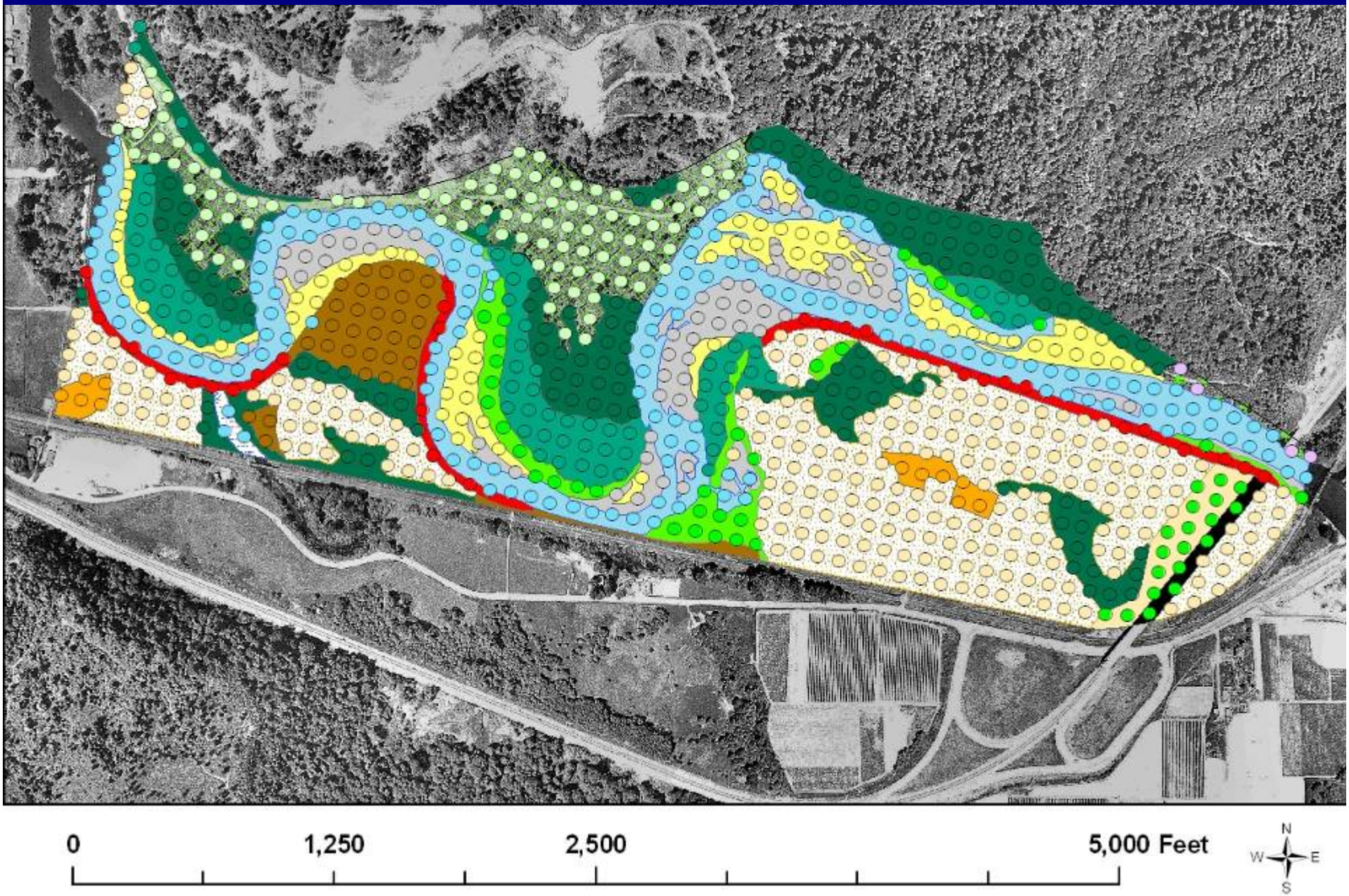
3. Track fate of each sampling point



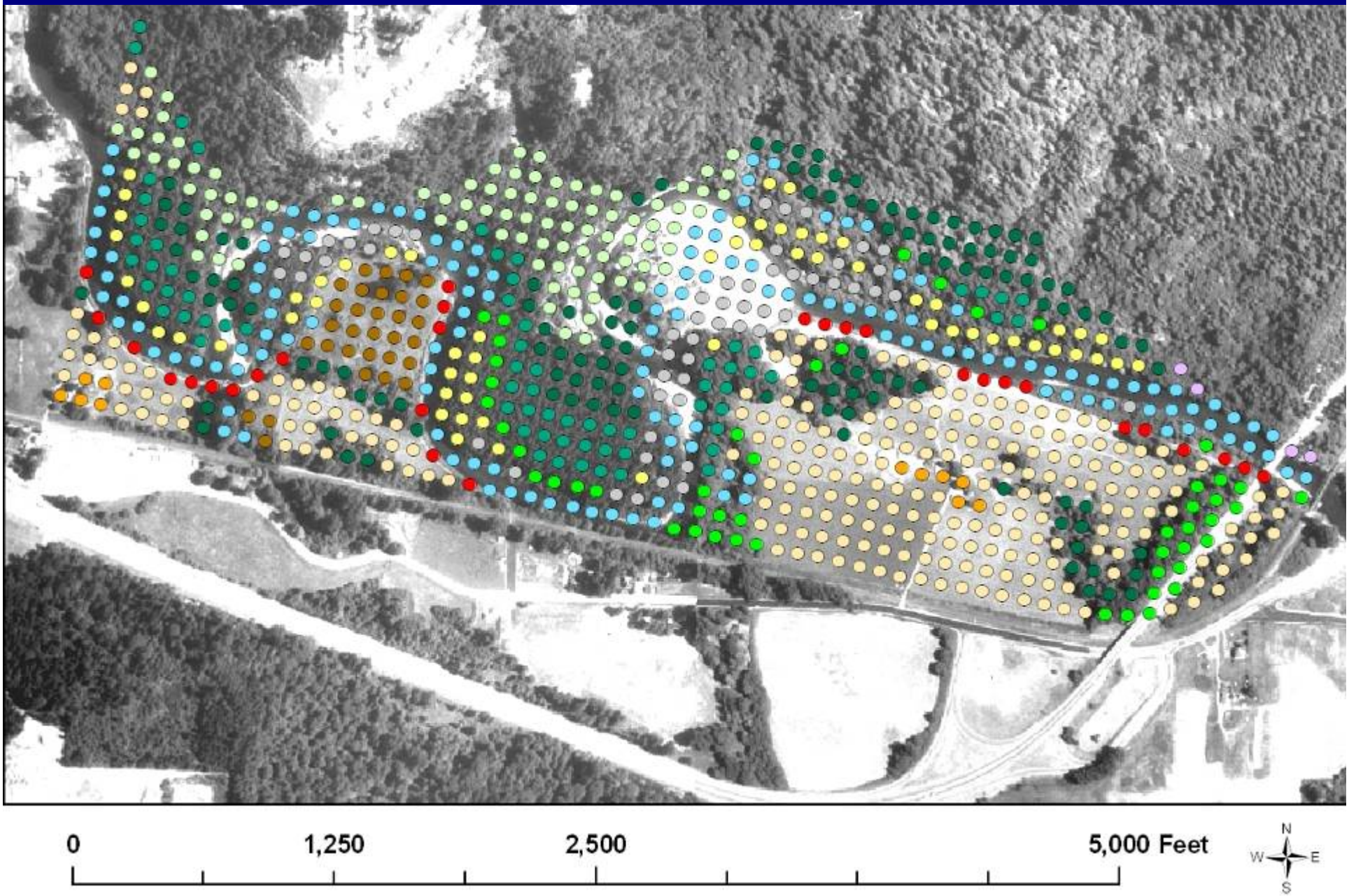
0 1,250 2,500 5,000 Feet

N W E S

4. Classify POST-IMPACT landcover, new sampling pts

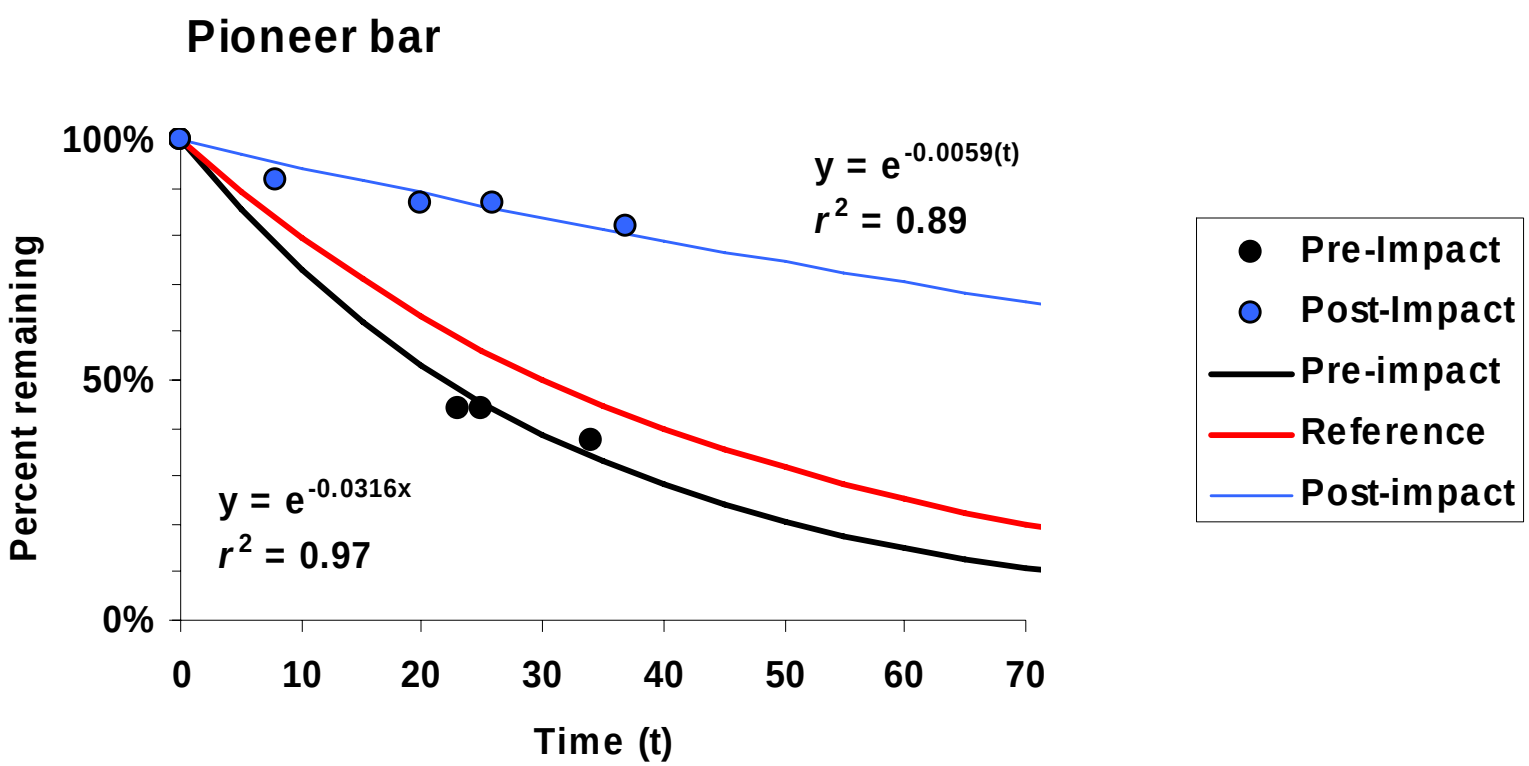


5. Track fate of each sampling point



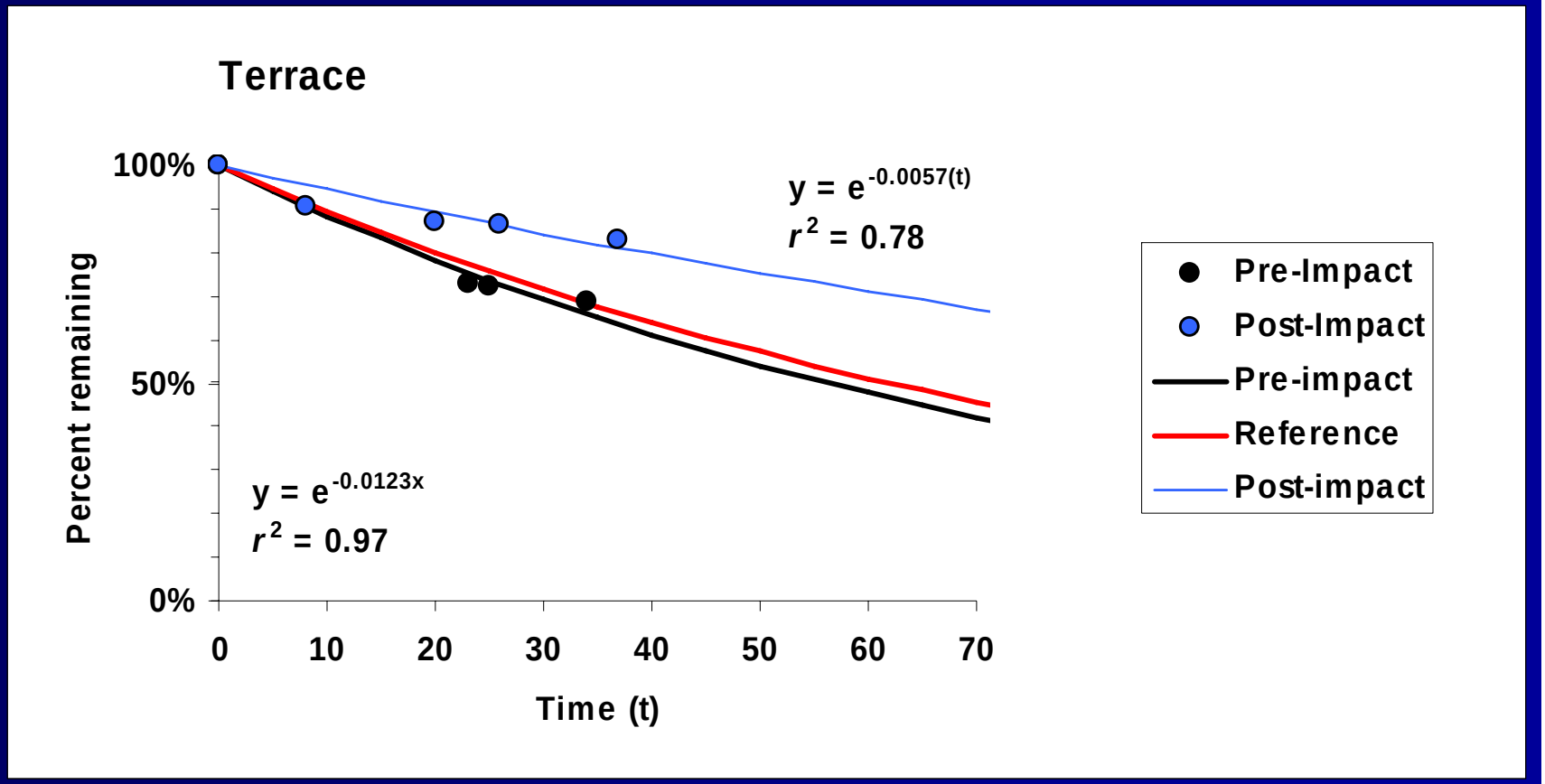
Results

- 81% decline in turnover rate
- Used to last 22 yrs, now last 117 years
- Indicative of terrestrialization



Results

- 54% decline in turnover rate
- Used to last 56 yrs, now last 122 years



Patch turnover delivers large wood

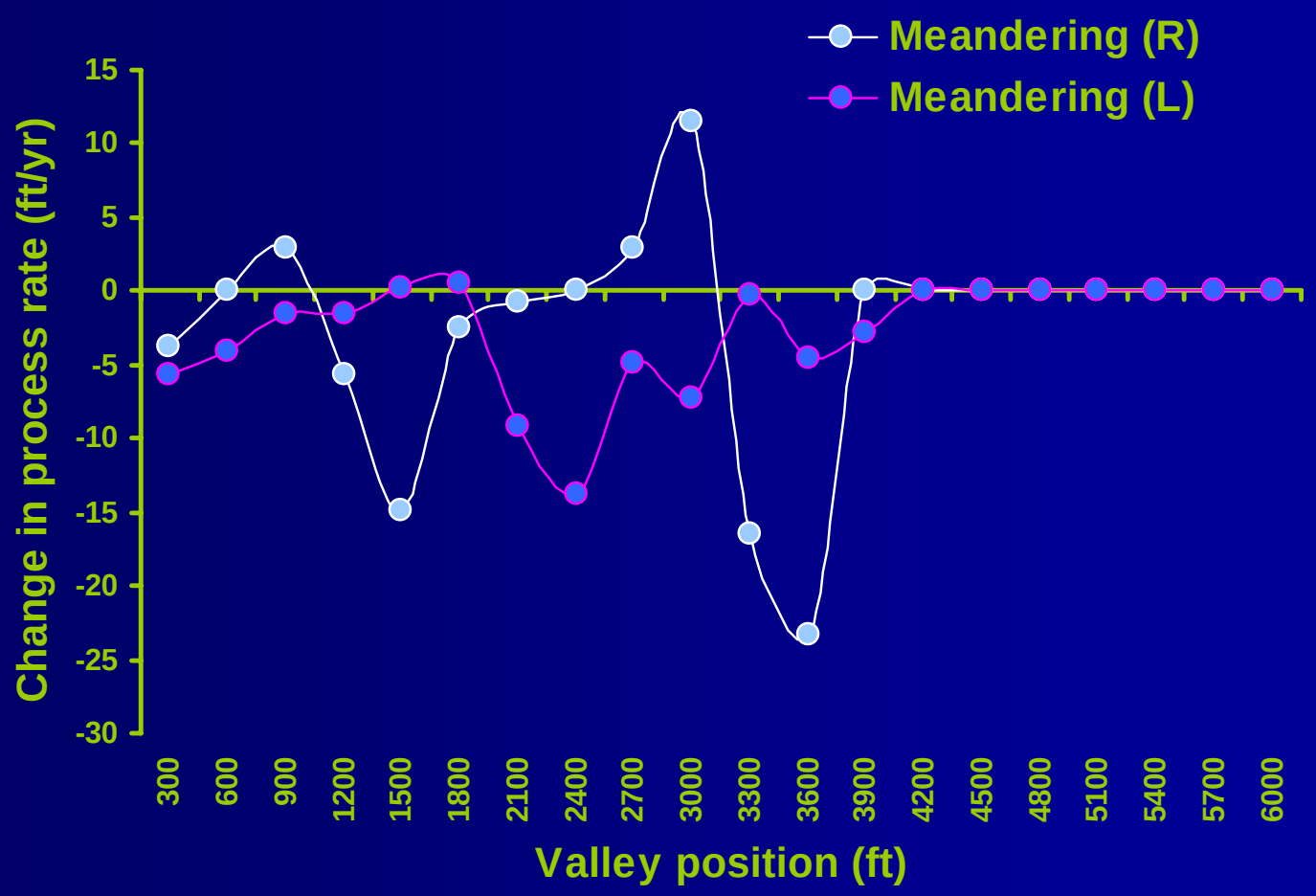
Replenishes spawning gravels

Maintains young forests

Nutritious leaf litter

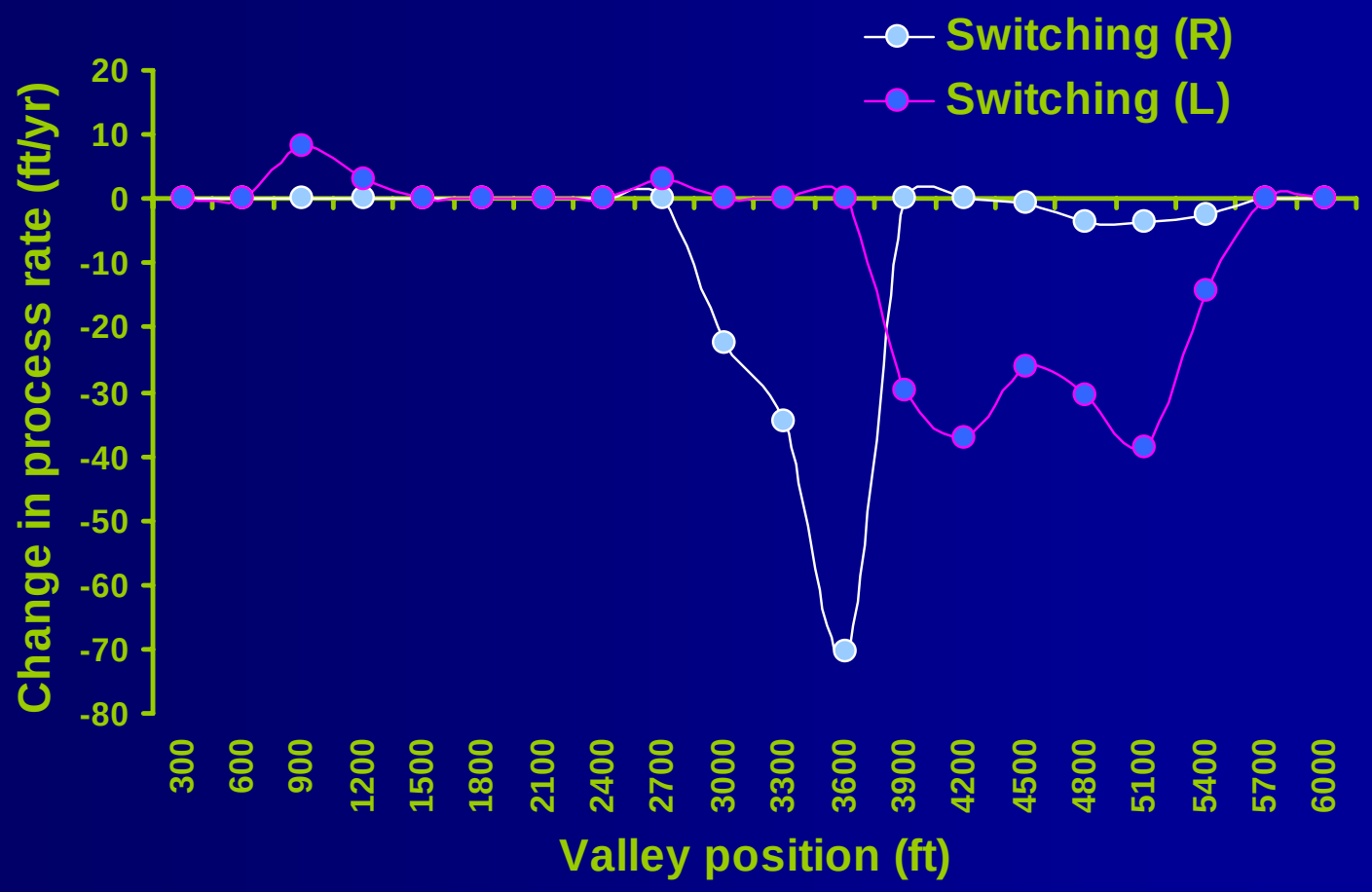
Conclusions

- Reduced meandering by 4 ft/yr (from 0-3900 ft), especially river left



Conclusions

- Reduced switching by 11-14 ft/yr (from 2700-6000 ft)



Conclusions

- Patches erode more slowly, last longer
- Young forests in decline

	Change in erosion rate	Change in eroded area
Pioneer bar	-81%	-92%
Floodplain	-45%	0%
Terrace	-54%	-62%

Ecological consequences

- Wood
  - -250 m^3 y^{-1}
  - -15,000 pieces (mostly small)
- Sediment
  - -11,000 CY y^{-1} (rough estimate)
- Soil N
  - -200 kg N y^{-1}
    - Amount in roughly 1,000 salmon carcasses

Next steps

- Field surveys to quantify ecological consequences
- Effectiveness monitoring
  - Post-restoration
  - Structural changes
  - Changes in process rates

Will we see a return to pre-impact conditions?

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