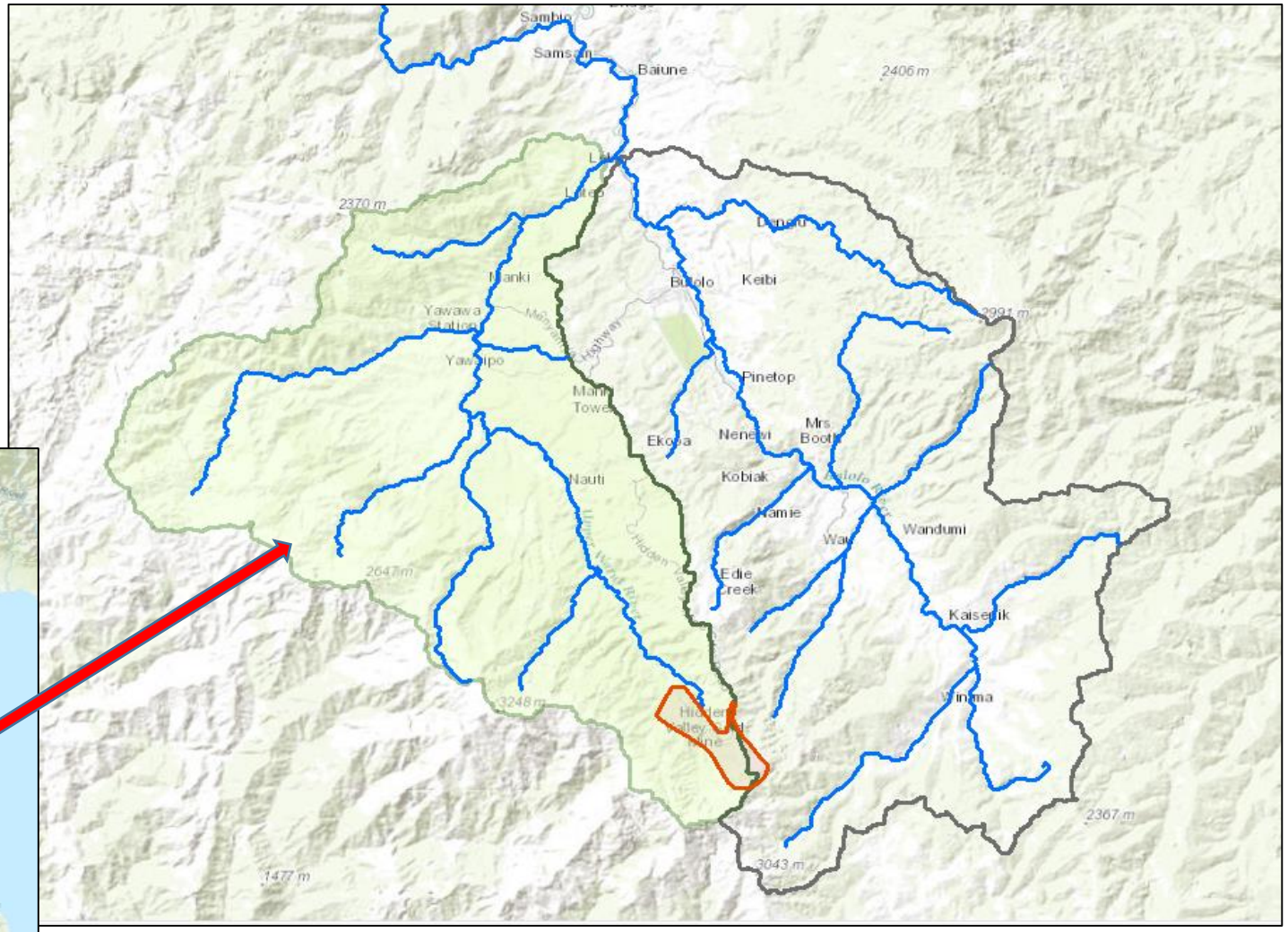
Lightning Talks by Students in the WATR 404/604 class

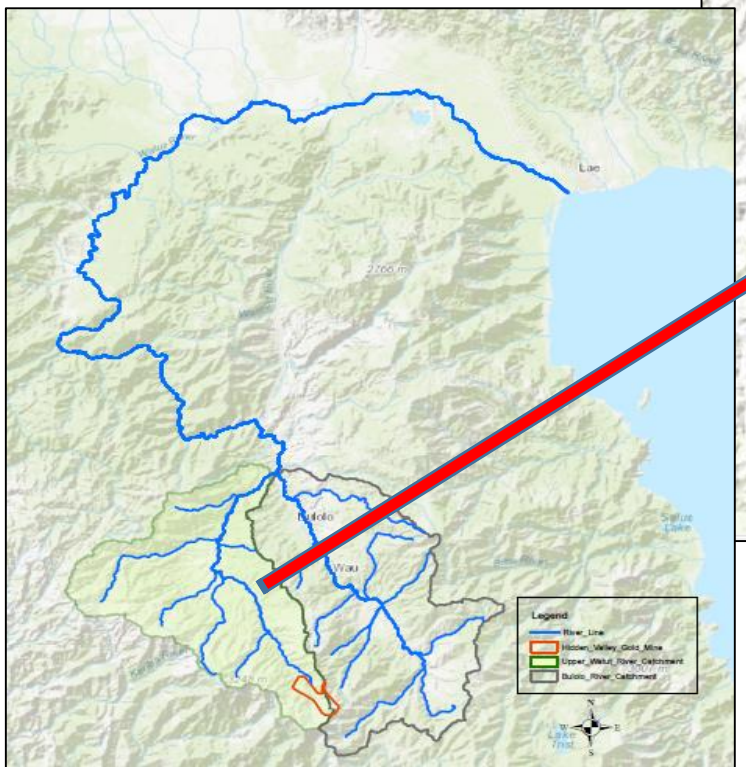
- Faith Angoro: Upper Watut catchment, Papua-New Guinea
- Sally Coates: Flood hydraulics in the Heathcote River catchment
- Mohamad Odeh: GIS-based stormwater modeling for Christchurch
- Sokna Ly: Water modeling for the Otaio catchment
- Michael Perry: Terrain analysis using Digital Elevation Models
- Sarah Giles: Story Maps of the Ashley River catchment
- Ellen Wadsworth: Story Map of the Grey River catchment

Upper Watut River Catchment – Papua New Guinea
By Faith Angoro

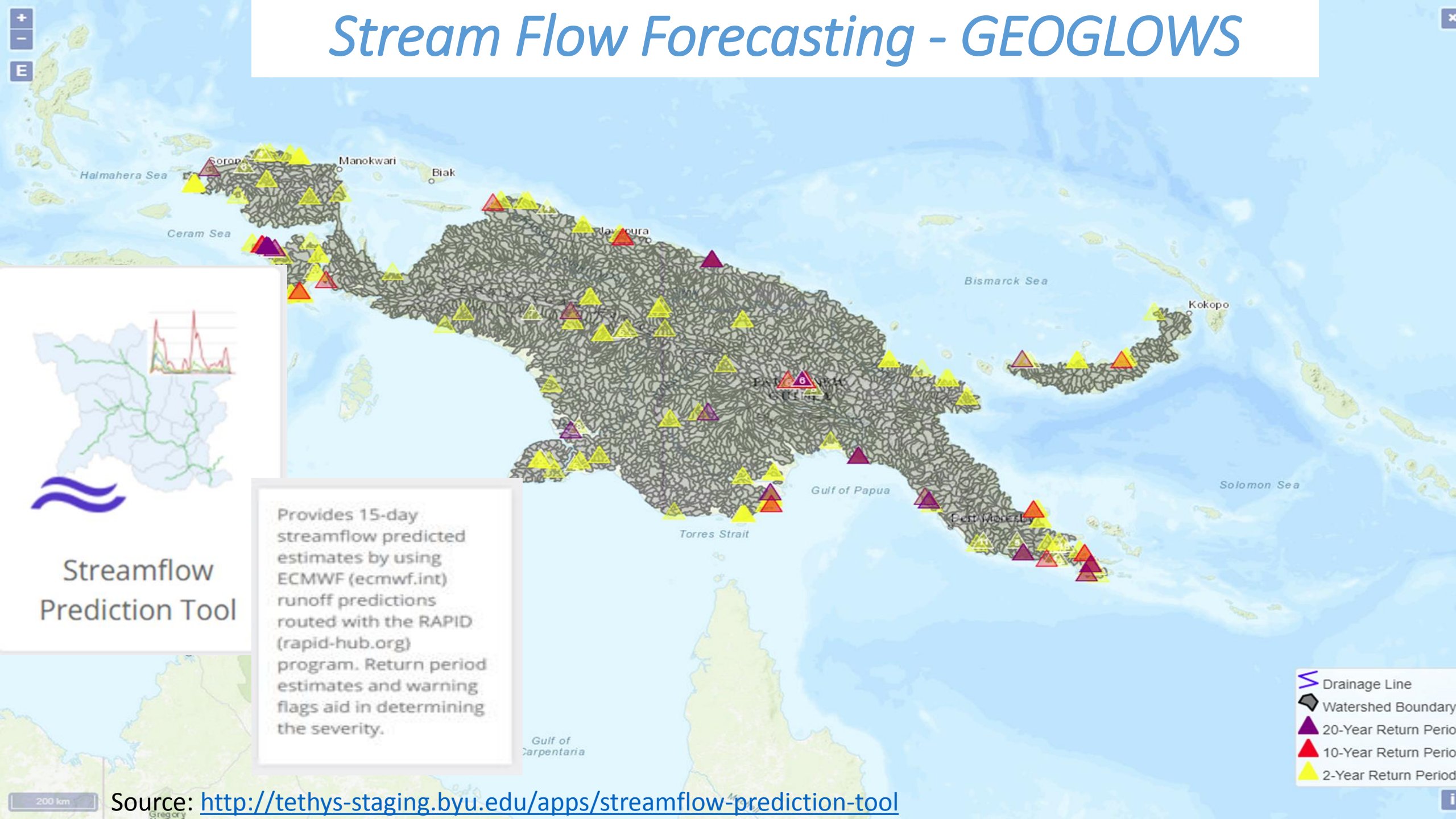
Land Use

- Large Scale Open Pit Mine
- Small Scale Alluvial Mining
- Subsistance Agriculture





Stream Flow Forecasting - GEOGLOWS

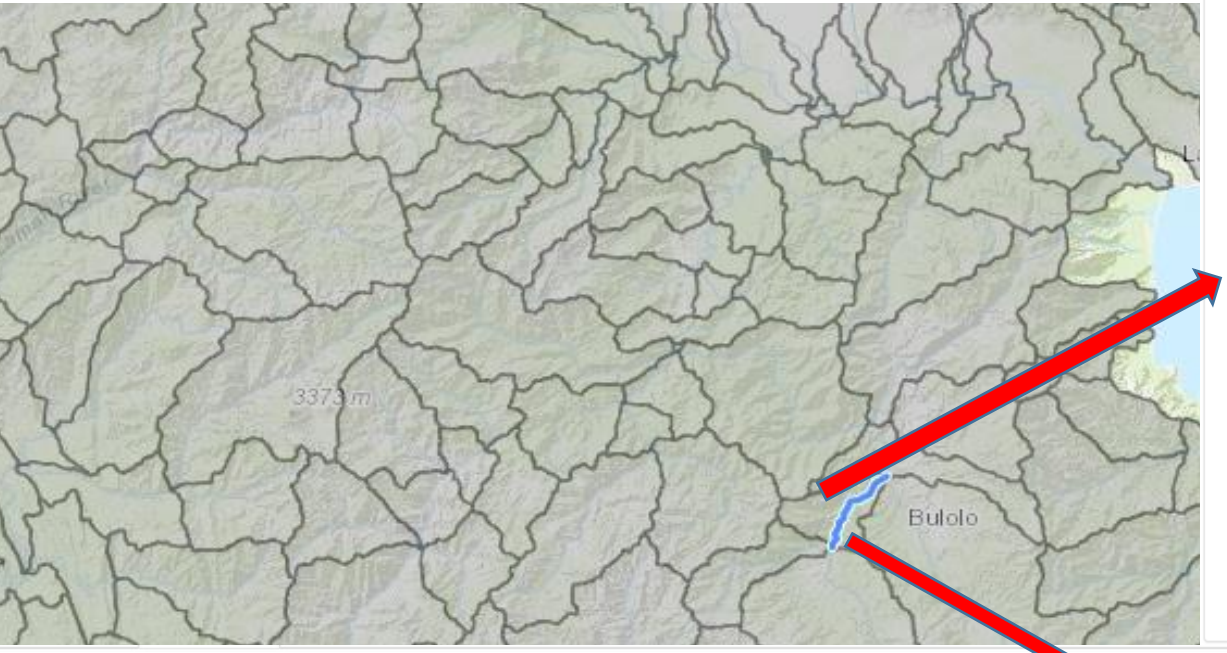


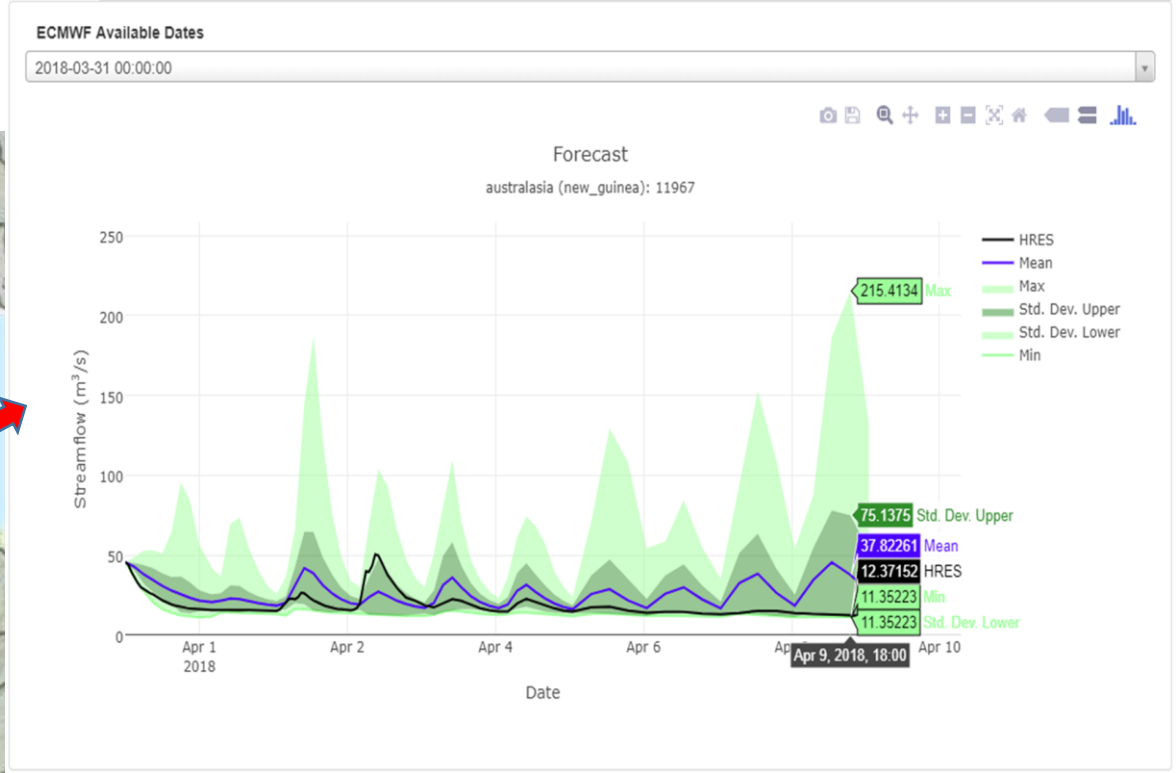
Streamflow Prediction Tool

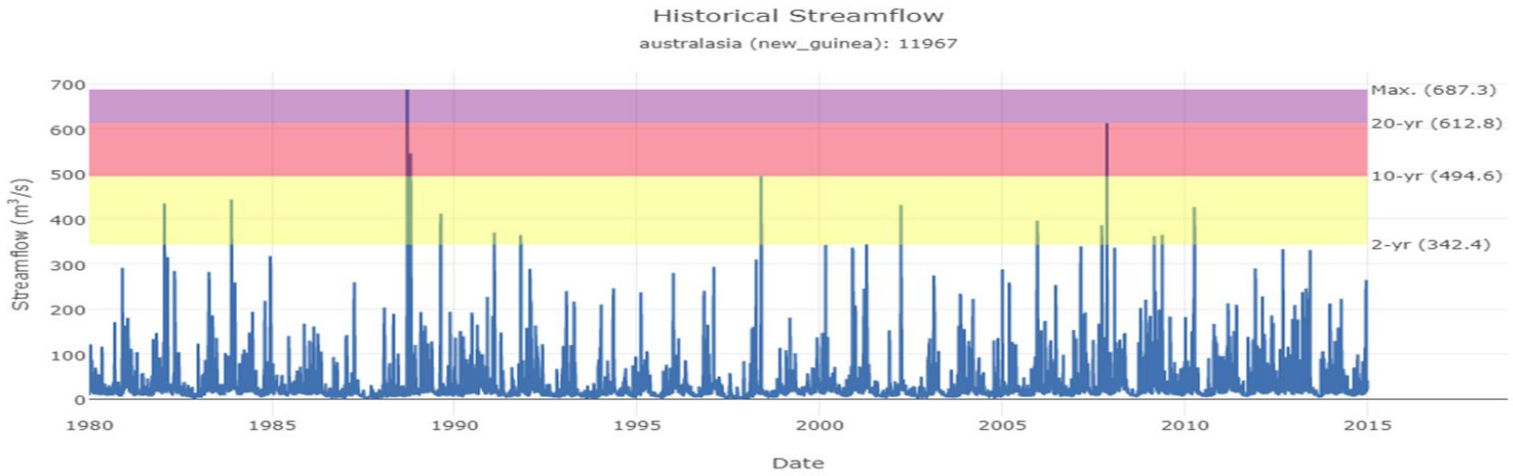
Provides 15-day streamflow predicted estimates by using ECMWF (ecmwf.int) runoff predictions routed with the RAPID (rapid-hub.org) program. Return period estimates and warning flags aid in determining the severity.

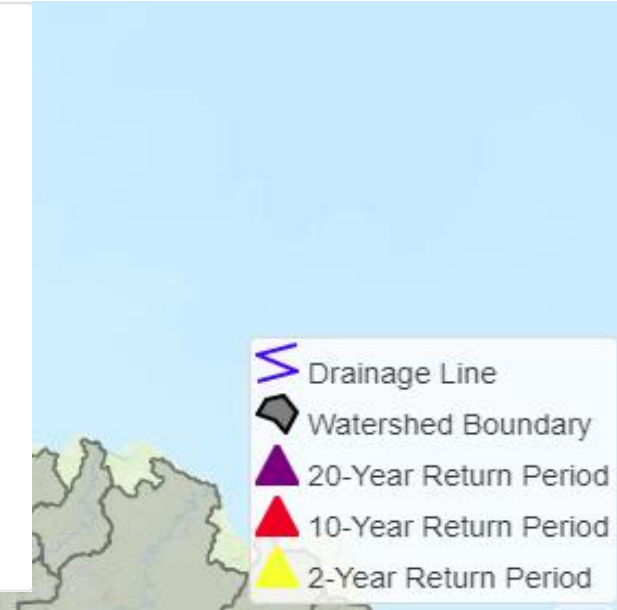
Source: http://tethys-staging.byu.edu/apps/streamflow-prediction-tool

Stream Flow Prediction Tool





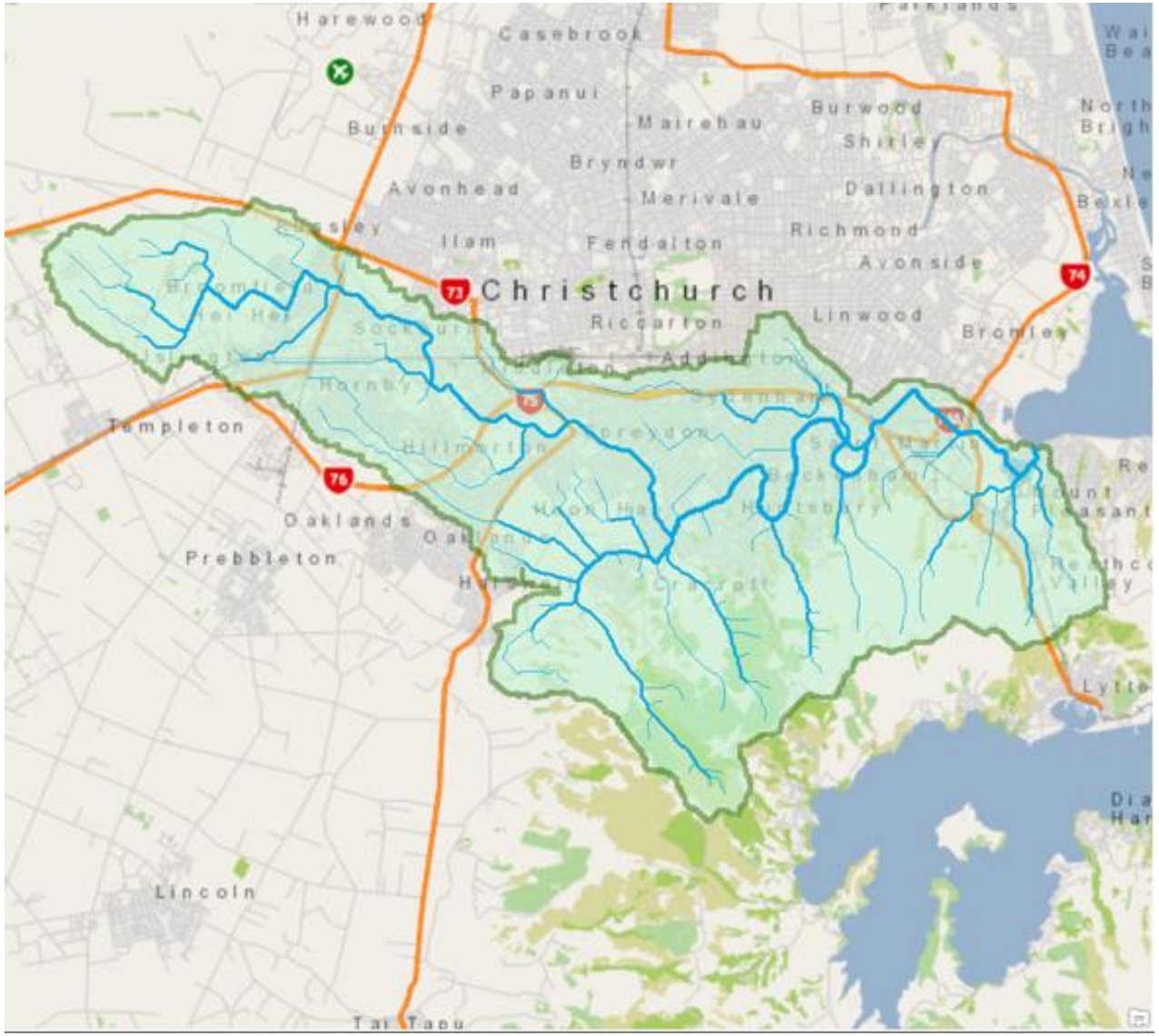




Source: http://tethys-staging.byu.edu/apps/streamflow-prediction-tool

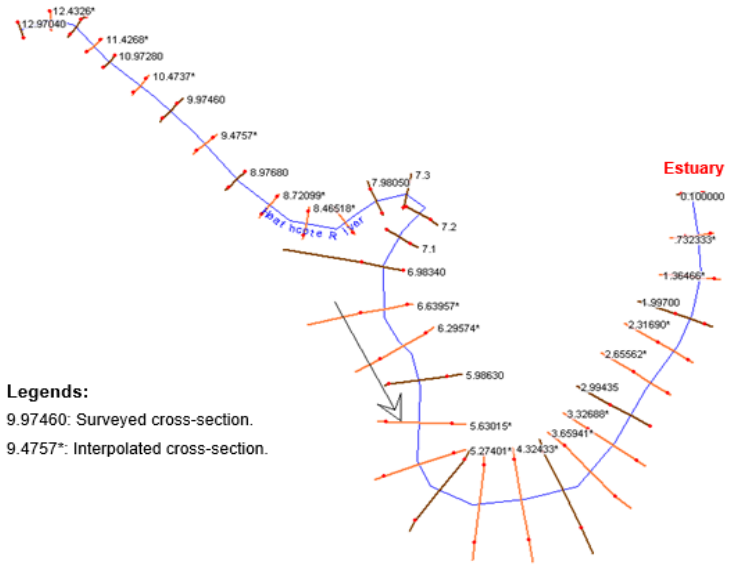
Flood Hydraulics in the Heathcote River Catchment

By Sally Coates



Heathcote River Photos

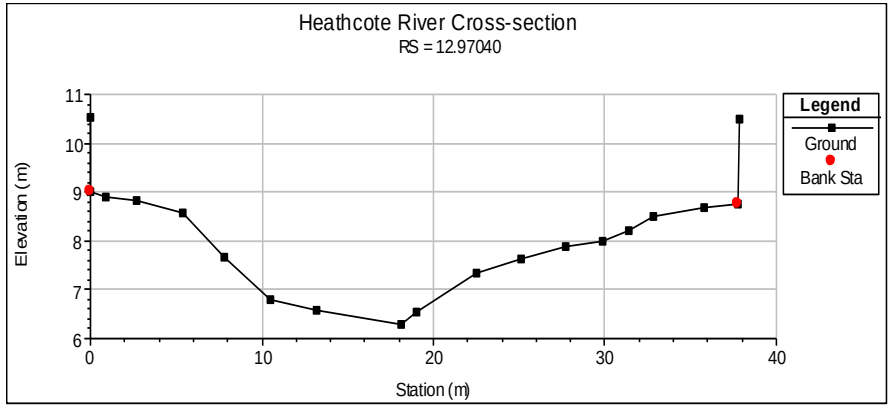
Heathcote River Schema and Sample Cross Sections, Estuary Reach*

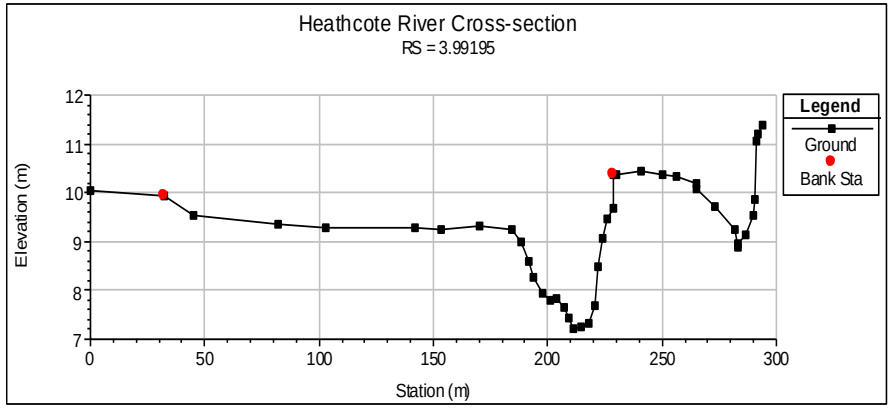


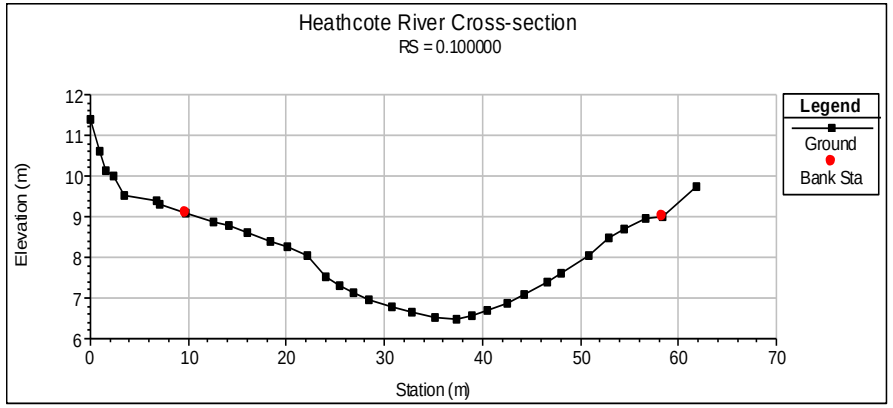
Legends:

9.97460: Surveyed cross-section.

9.4757*: Interpolated cross-section.



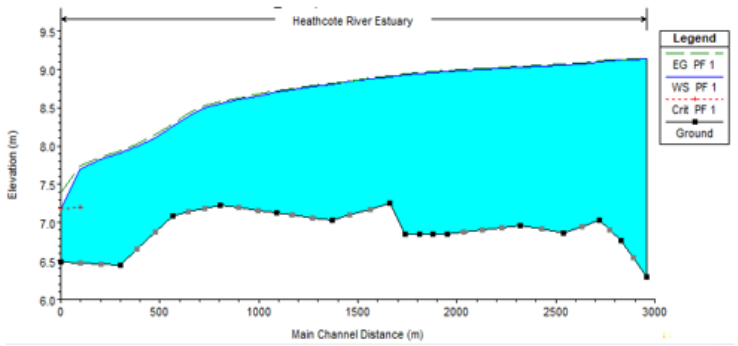




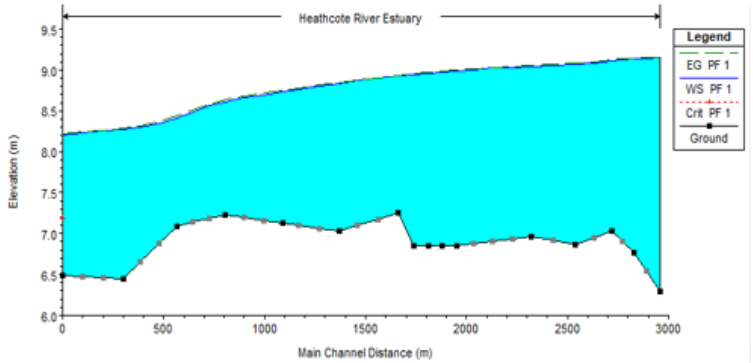
* ENCN444 “Water Infrastructure and Design” , Assoc Prof Tom Cochrane, UC

HEC-RAS Water Surface Profiles

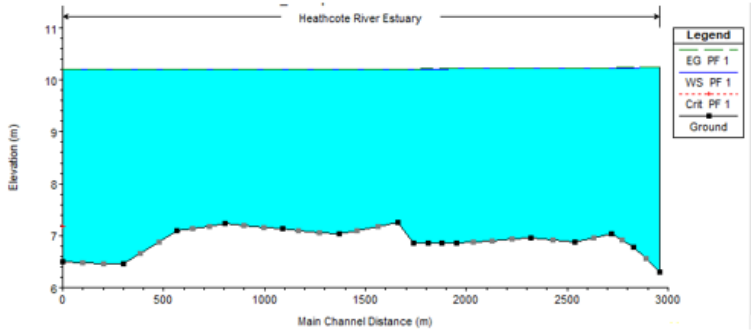
Mean Annual Flood (15.9 m3/s) with no tide effect



Mean Annual Flood (15.9 m3/s) at low tide



Mean Annual Flood (15.9 m3/s) at high tide



Flood Level	Upstream water level (m) No tide[1]	Upstream water level (m) Low tide[2]	Upstream water level (m) High Tide[2]
1 year (mean annual)*	9.14	9.15	10.23
10 year*	9.42	9.42	10.83
1 year **	8.92	8.93	10.22
10 year**	9.16	9.16	10.81
1 year***	8.62	8.66	10.20
10 year***	8.83	8.83	10.80

Mean annual flood at Buxton Terrace = 15.9 m^3/s

10 year flood at Buxton Terrace = 22.5 m^3/s

*manning's n 0.035 LOB, channel, ROB

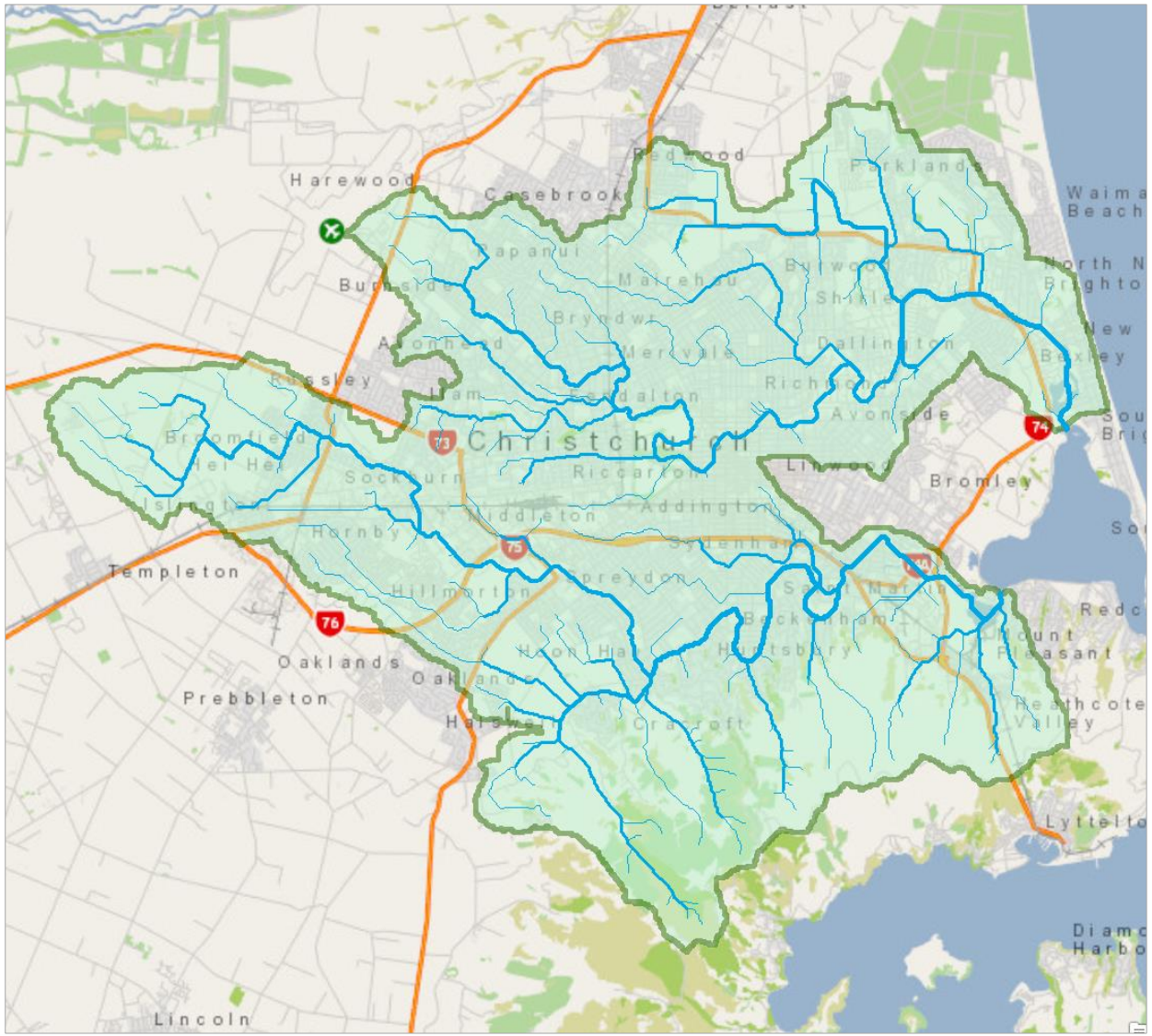
** manning's n 0.035 LOB/ROB, 0.025 channel, ROB

*** manning's n 0.035 LOB/ROB, channel 0.020 (upper cross sections) and 0.025 (lower cross sections)

1 downstream water level set at critical (free overfall)

2 downstream water level set according to typical tidal amplitude for mean annual flood and 10 year design amplitude for 10 year flood

Modeling Rainwater Harvesting as a Low-Impact Development Practice Using GIS-based Stormwater Management Model (SWMM).



Case Study; Christchurch River catchments

LINCOLN UNIVERSITY

Special Topics in Water Resource Management

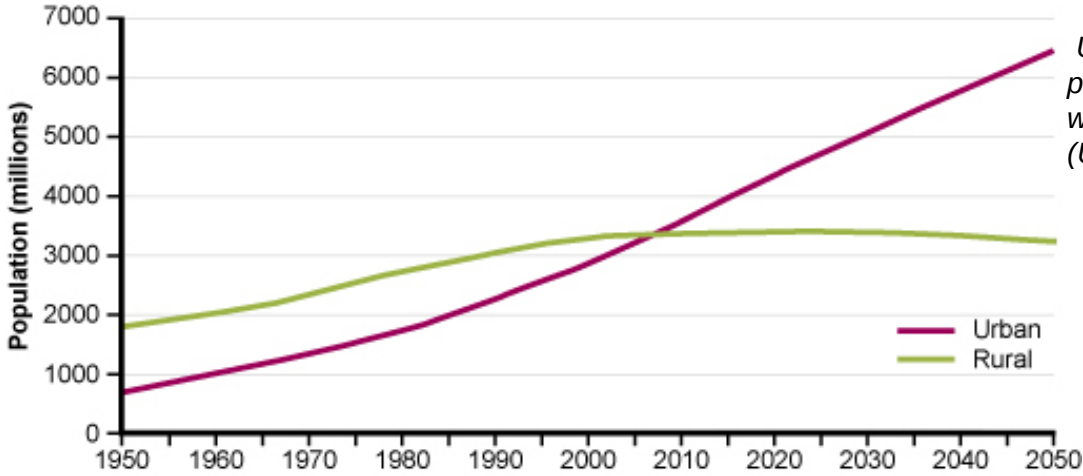
"Integrated Data to Support Water Modeling"

Professor David Maidment

Prepared by: Mohamad Odeh

"LOW-IMPACT DEVELOPMENT AND STORMWATER MANAGEMENT"

- **URBANIZATION** ↗
- **Total Impervious Areas (Building, Street, Etc.)** ↗
- **Storm water runoff & Urban Flood Risks.** ↗
- **Groundwater recharge.** ↓
- **Water contamination.** ↗

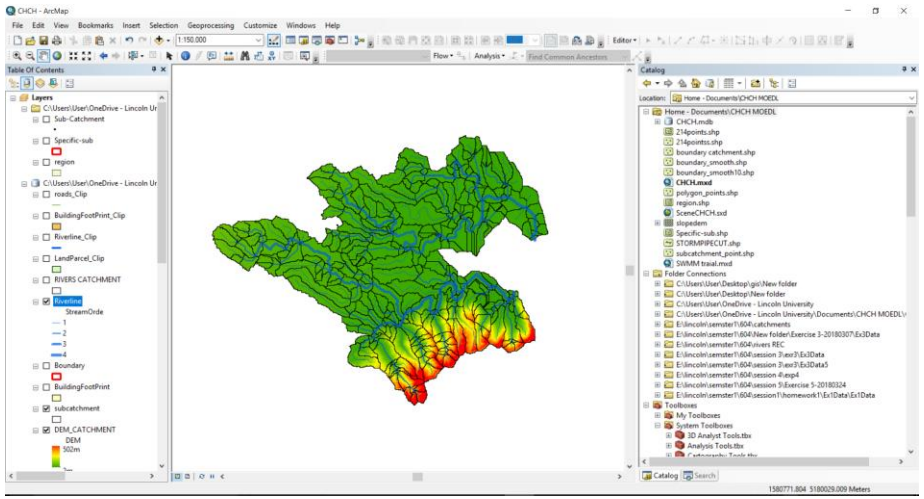


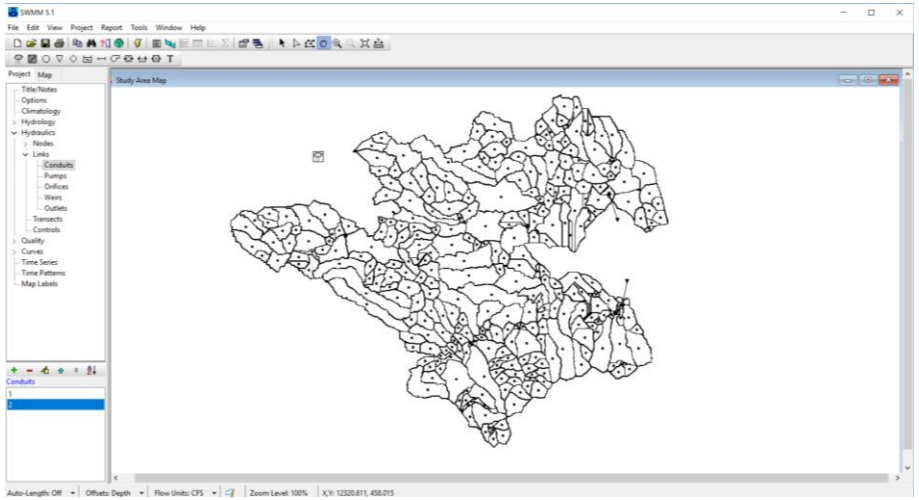
Urban and rural population of the world,1950-2050. (UNDESA,2014)

For better evaluation of LID impacts , GIS based SWMM model proposed

ArcMap

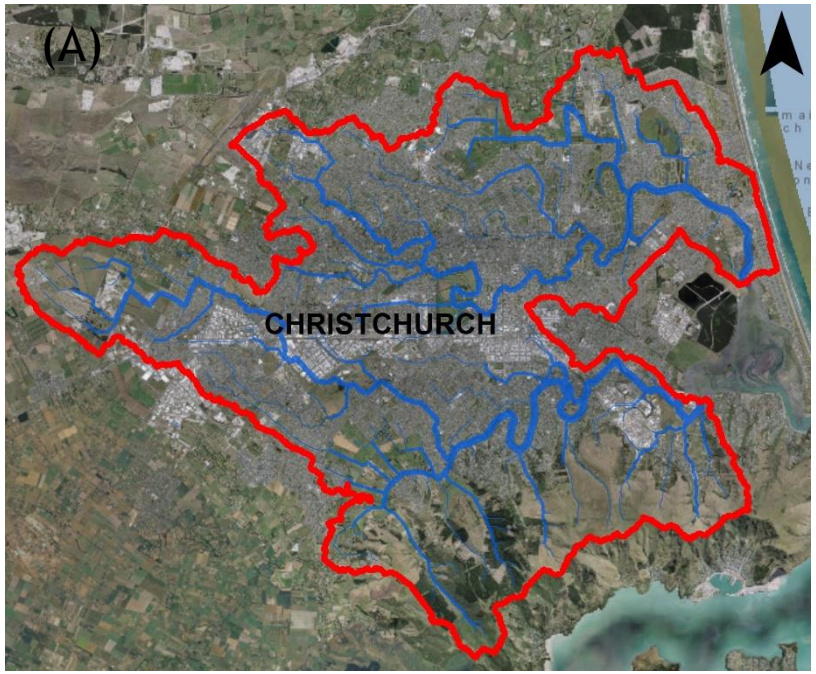
Input data:
REC
DEM
Land use
Stormwater
Bld. & Road

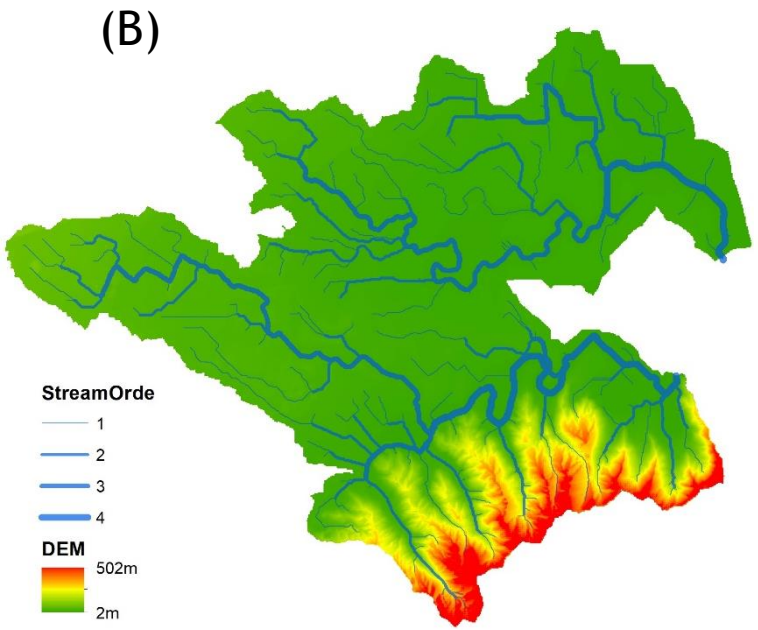


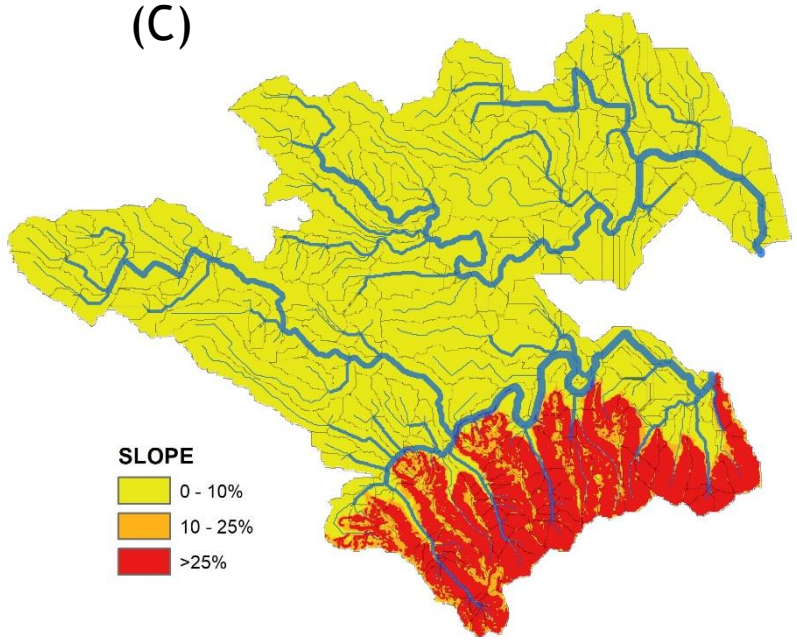


SWMM

Analysis
Design
Evaluation

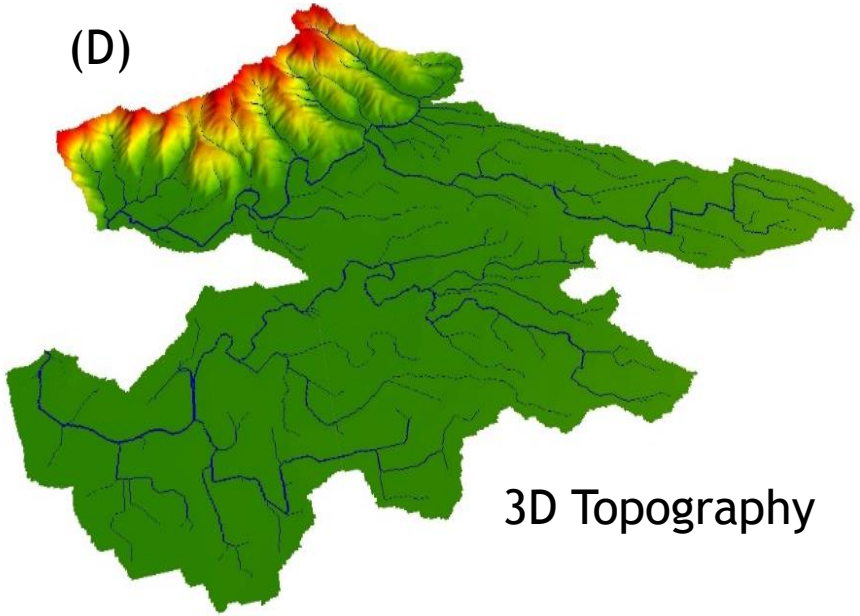




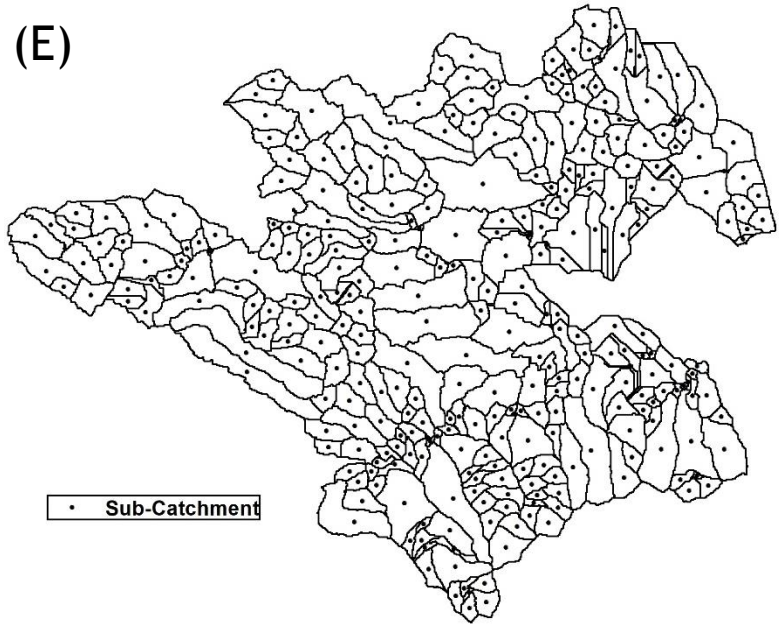


Maps of the study area:

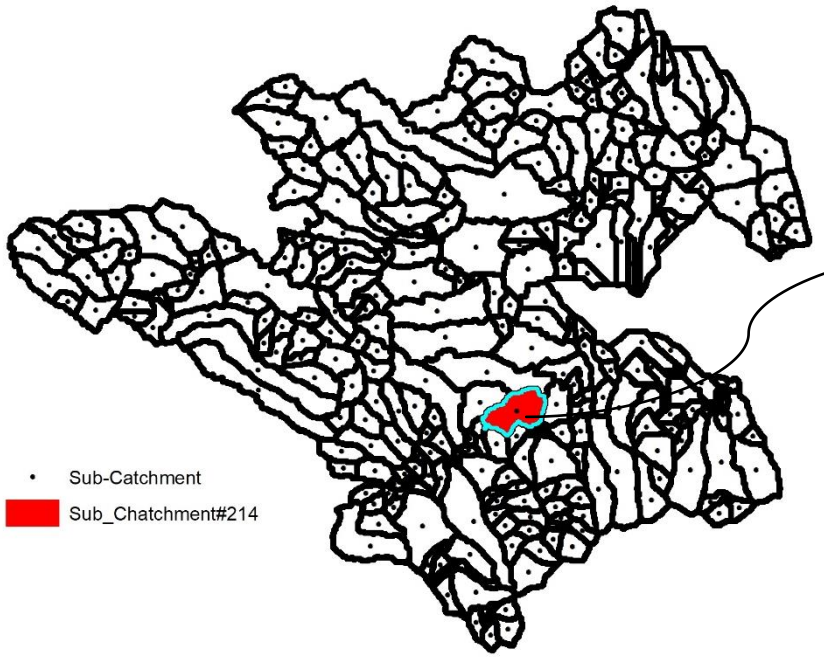
A. Imagery map showing the boundary of the Catchments.
B. the DEM (Digital Elevation Model 15x15m) analysis and Rivers Line.
C. Slope of the Sub-catchments
D. 3D Topography.
E. 322 discretized sub-catchments created in the study area.



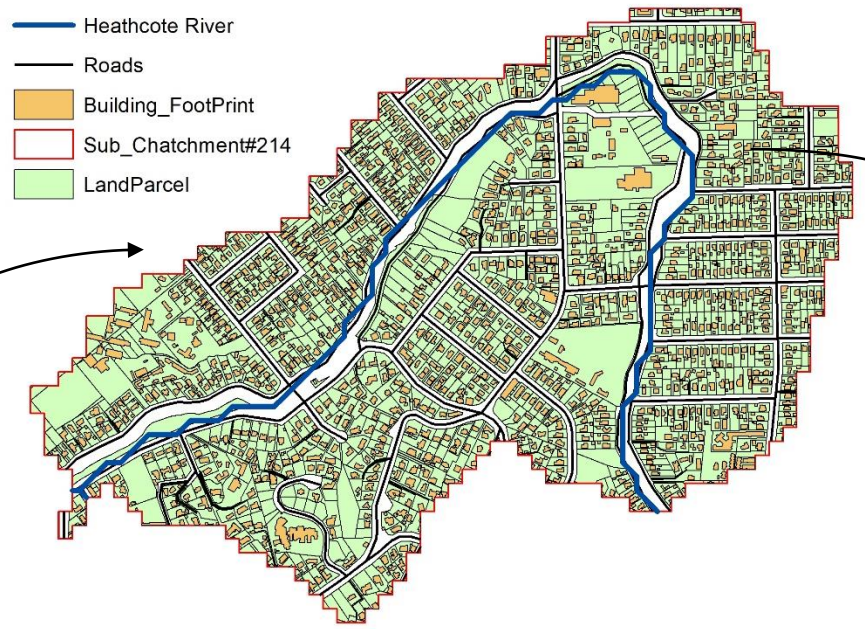
3D Topography



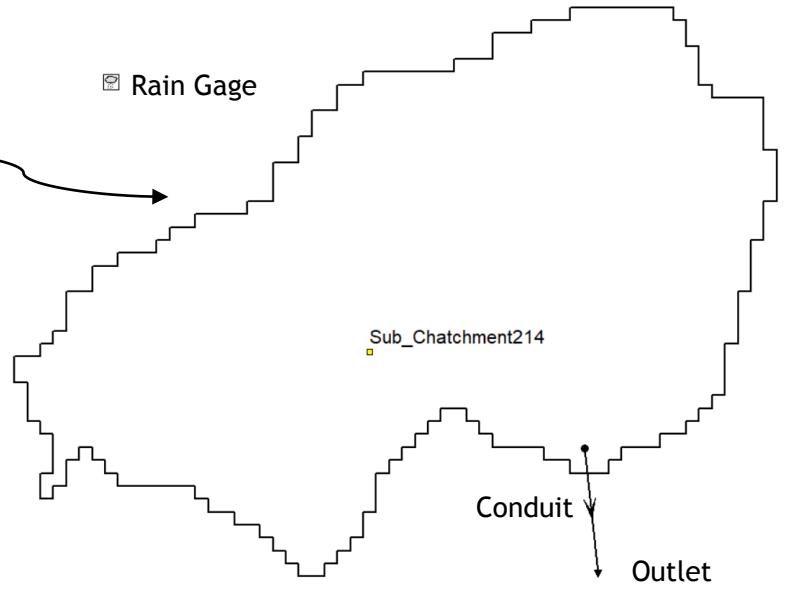
(a) Sub-Catchment #214, near Beckenham suburb



(b) GIS-Analysis of the Beckenham Sub-Catchment



(c) Exporting to the SWMM model



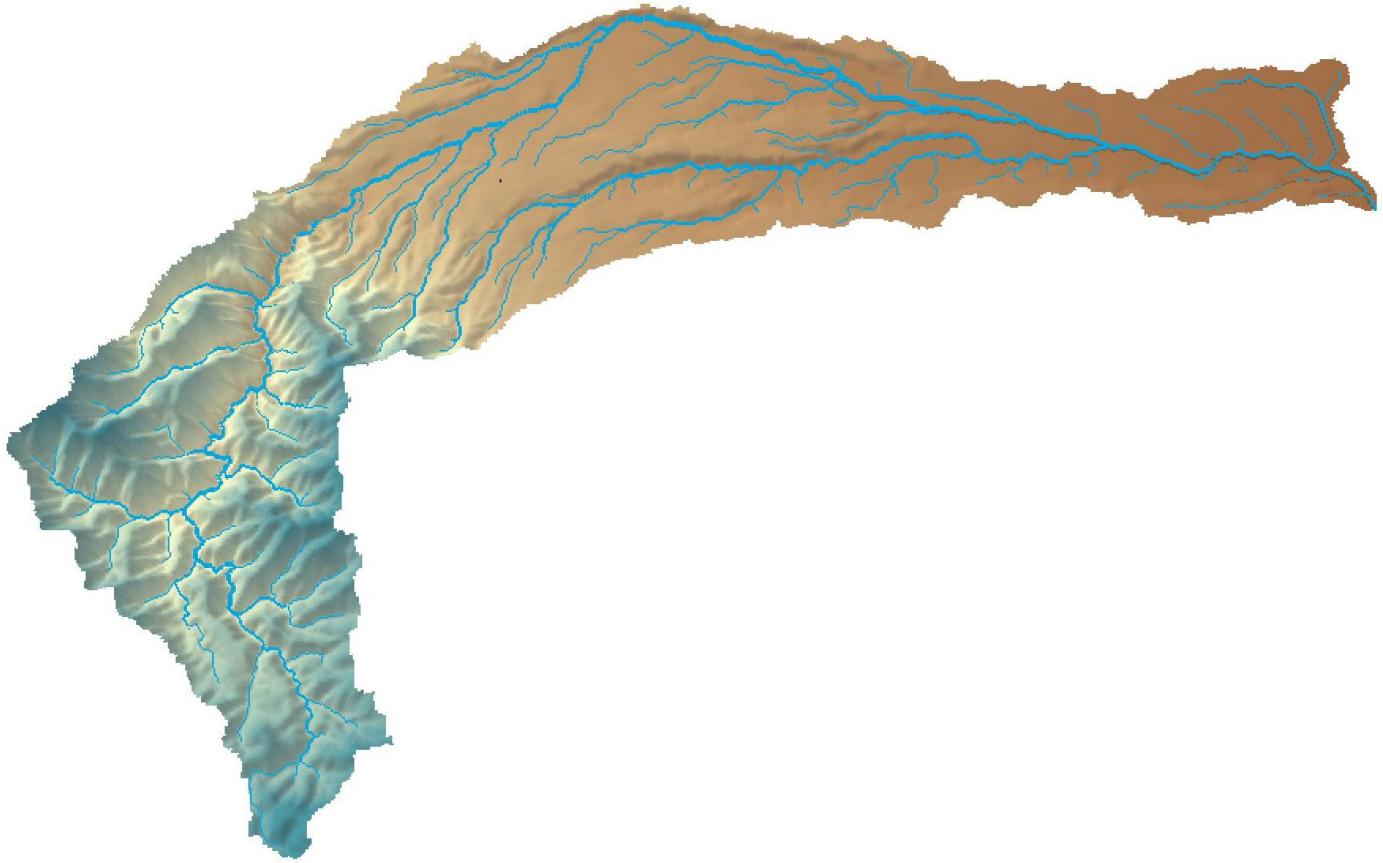
GIS-based SWMM model can support:

- ***Large-scale evaluation of RWH stormwater management.***
- ***Improving accuracy in stormwater runoff calculation per sub-catchment.***

The SWMM parameters which can be extracted from GIS datasets.

Type	SWMM parameter	GIS datasets
Sub-Catchments	Spatial location, Area,	River Environment Classification
	Impervious surfaces percentage,	15 m x 15m resolution DEM
	Slope, LID TIA, Outlet	Building Footprint Data
		Land use data, Soil data
Conduit	Spatial location, Shape, Diameter, Depth	Stormwater netowrk data
Junction	Spatial location, Depth	Stormwater netowrk data
Rainwater Outlet	Spatial location, Depth	REC, Stormwater network data

Water Modelling for Otaio Catchment

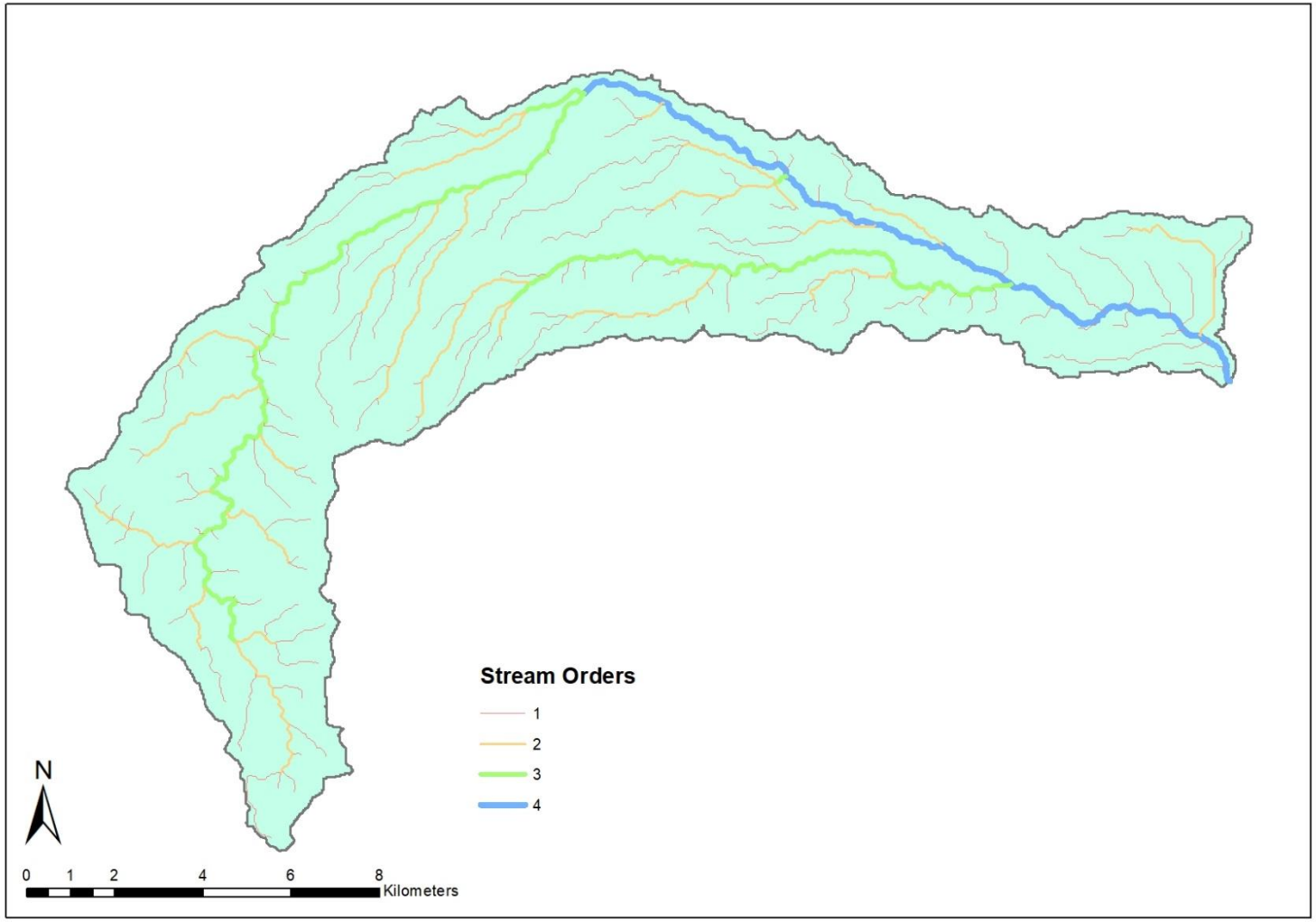


Course: WATR 604

Instructor: Dr. David R. Maidment

Presented by Sokna Ly

Otaio Catchment: Stream Orders

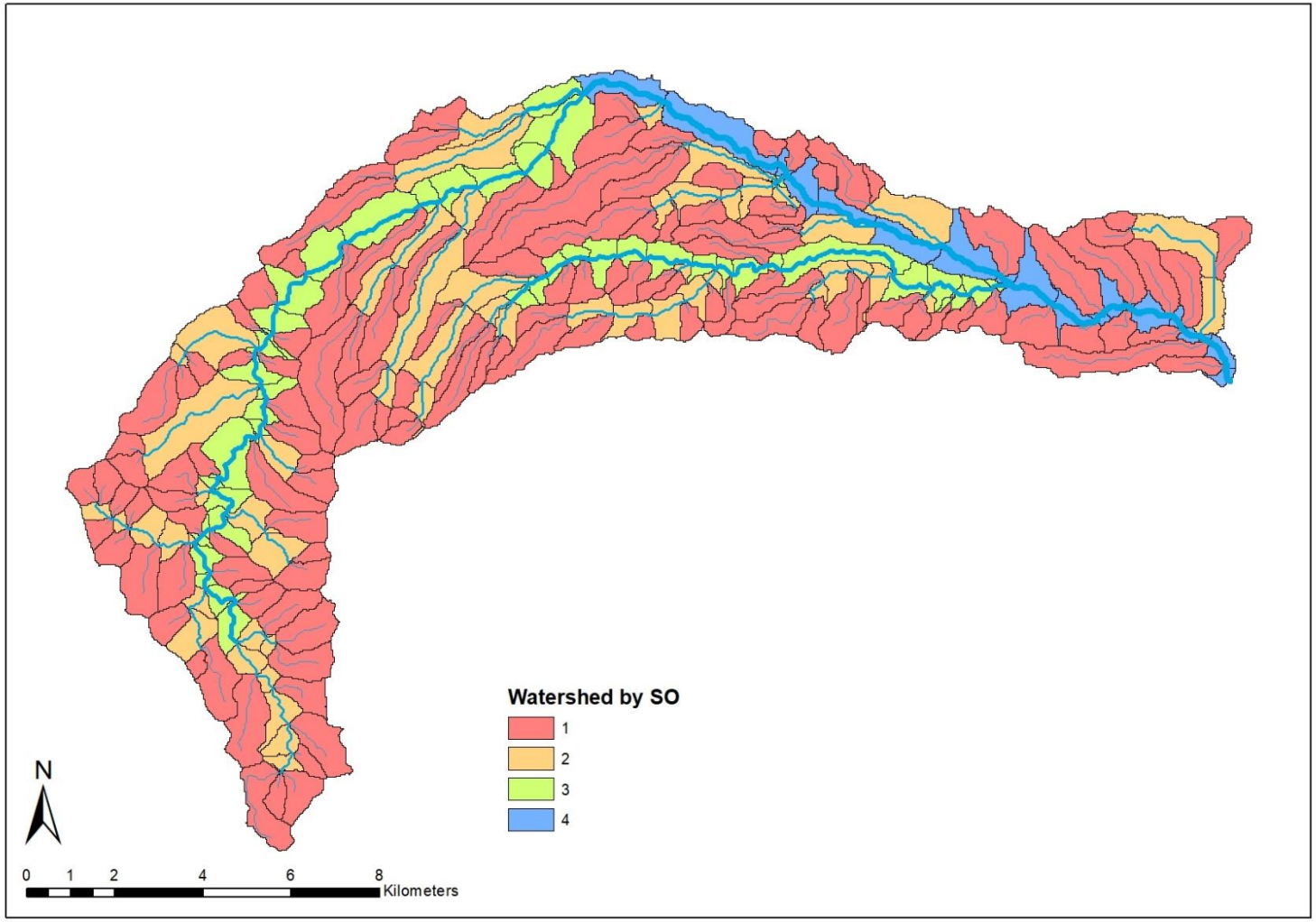


- Otaio Catchment has only 4 Stream Orders
- By using GIS ArcMap the total length of each stream order can be determined

Stream Order	Total Length (Km)	%
1	127.738	51.5
2	63.588	25.7
3	37.372	15.1
4	19.019	7.7

51.5 % of the stream length is Stream Order 1

Otaio Catchment: Watersheds



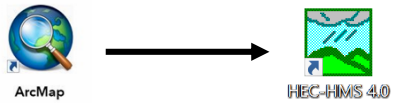
- The stream orders that have been classified are fed by little watersheds
- Each little watershed has a connection with stream

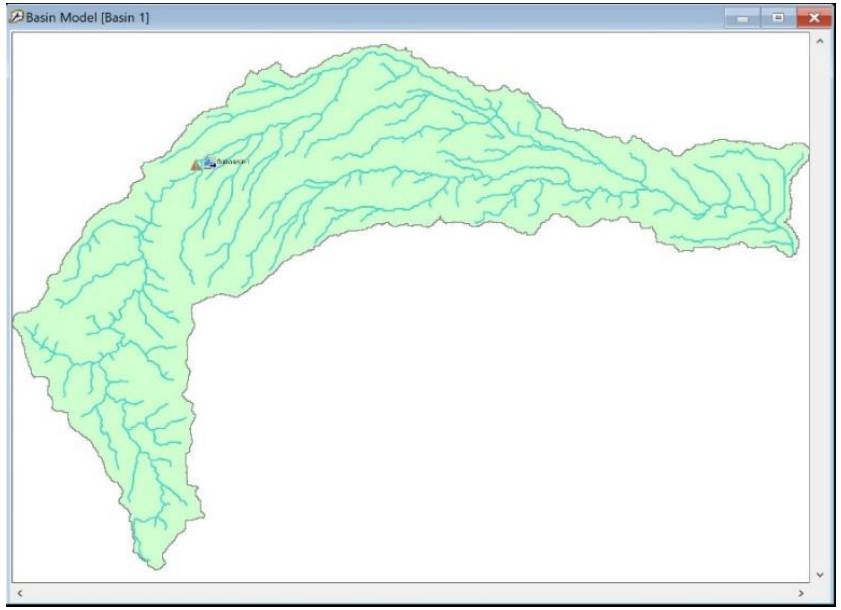
Stream Order	Total Area of Watershed (Km^2)	%
1	85.23	58.3
2	31.53	21.6
3	19.96	13.6
4	9.52	6.5

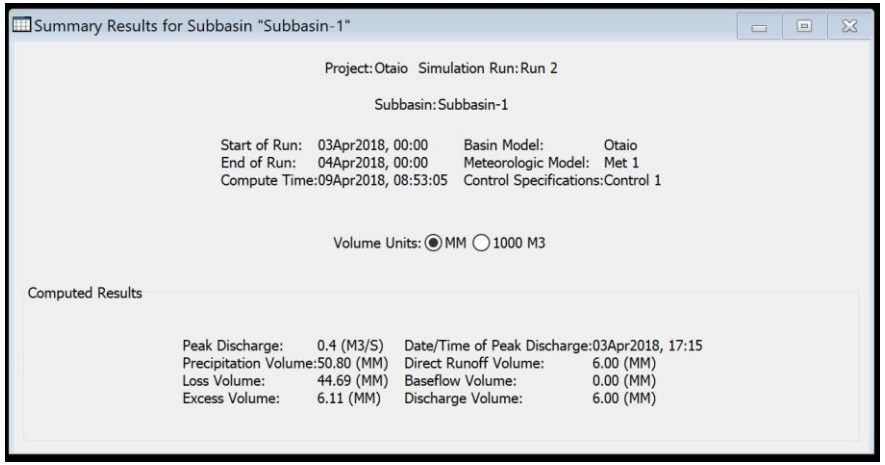
58.3 % of the area of watershed is Stream Order 1

Otaio Gorge: River Flow Modelling with HEC-HMS

- The data obtained from GIS is used in HEC-HMS

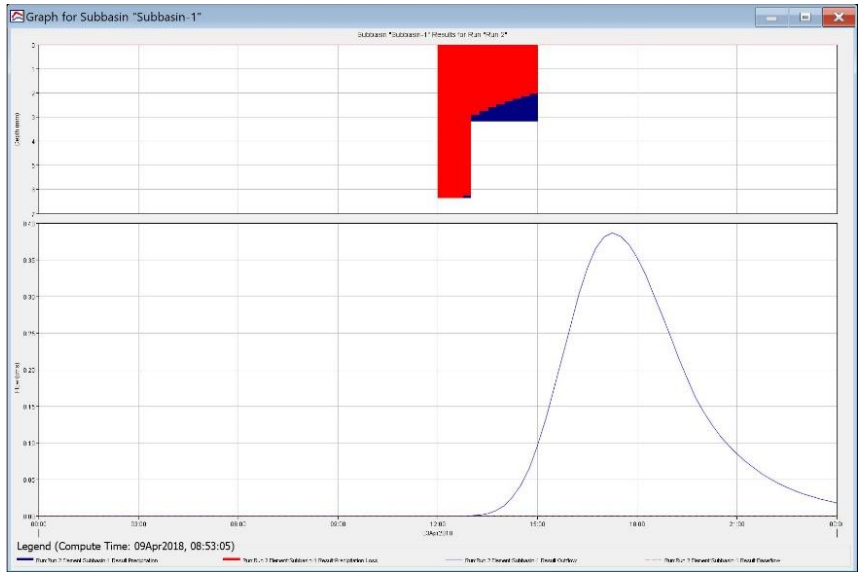


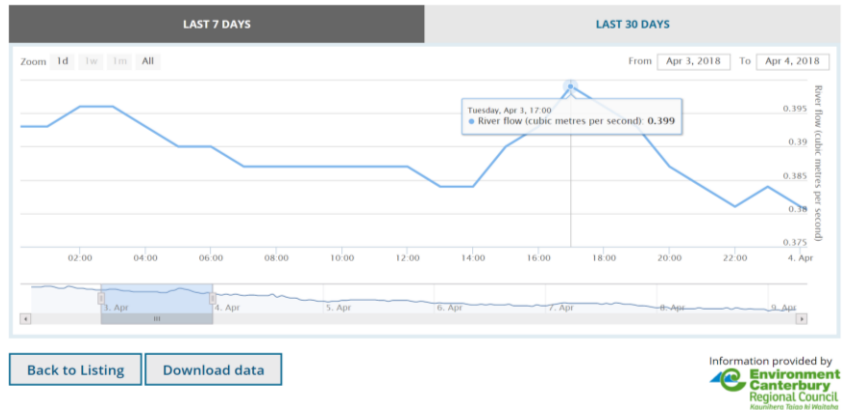




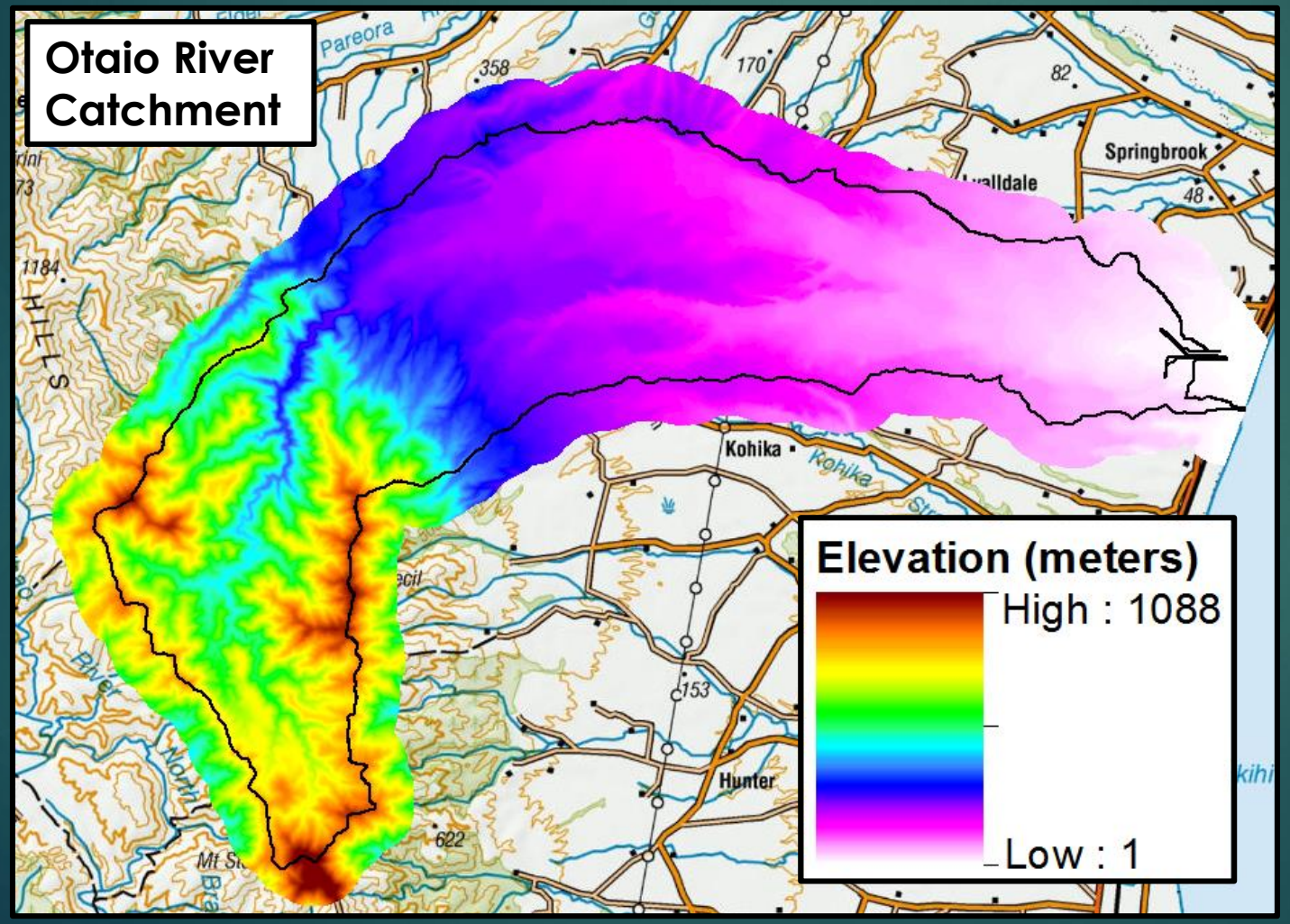
- The result at peak discharge is similar to the actual observed flow

How many of these streams carry water ?





Terrain Analysis Using Digital Elevation Models



78	72	69	71	58
74	67	56	49	46
69	53	44	38	37
69	58	55	22	31
68	61	47	21	16

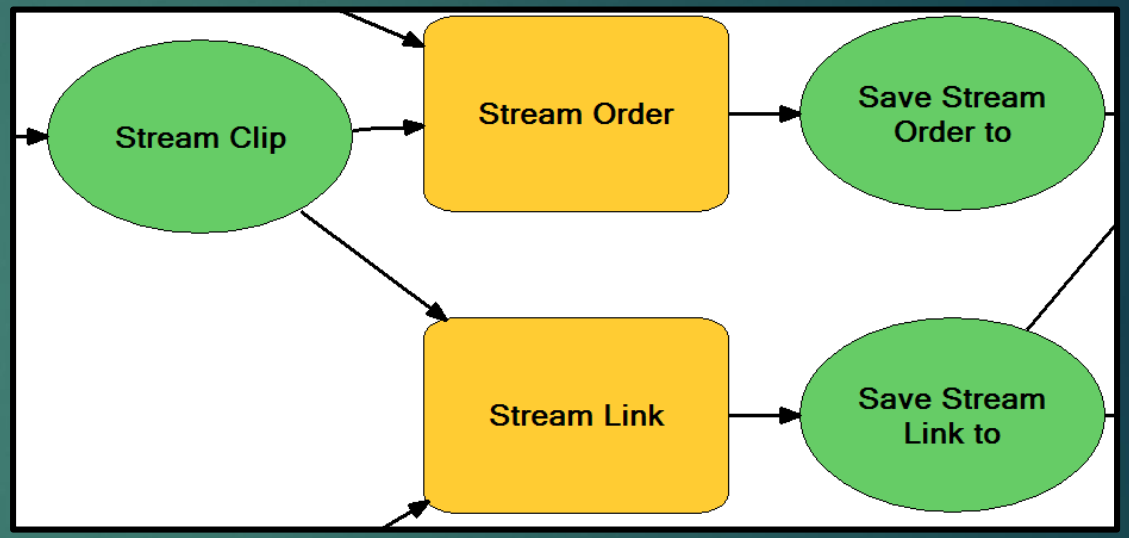
Digital elevation model

(8m x 8m cells)
from LINZ

| Michael Perry

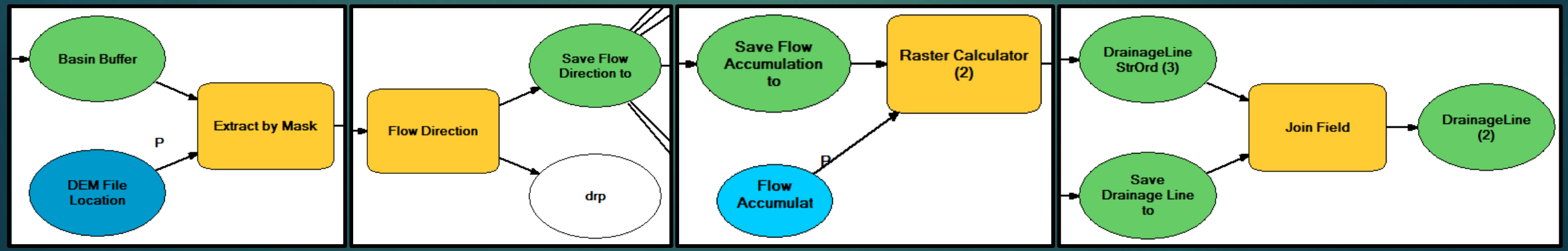
An Application - Watershed Delineation

- Clip DEM to basin area with a buffer
- Pit removal
- Calculate flow direction
- Calculate drainage line
  via flow accumulation threshold
- Create stream links
- Determine area draining directly to each link
- Ensure that one polygon represents one catchment



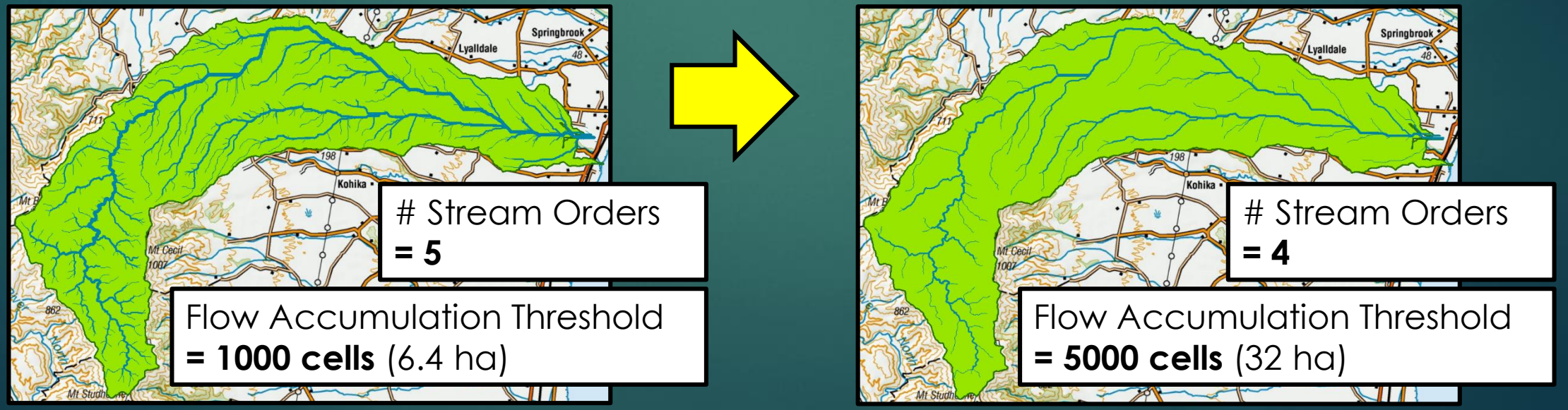
Model Builder – An Introduction

- Automate geographic information processing
- Chain together various ArcGIS tools, functions, and variables
- Massive amounts of time saved
- Gives greater opportunity to analyse other (larger, or more refined) areas of interest
- Pragmatically, gives a graphical representation of entire process to use for reference

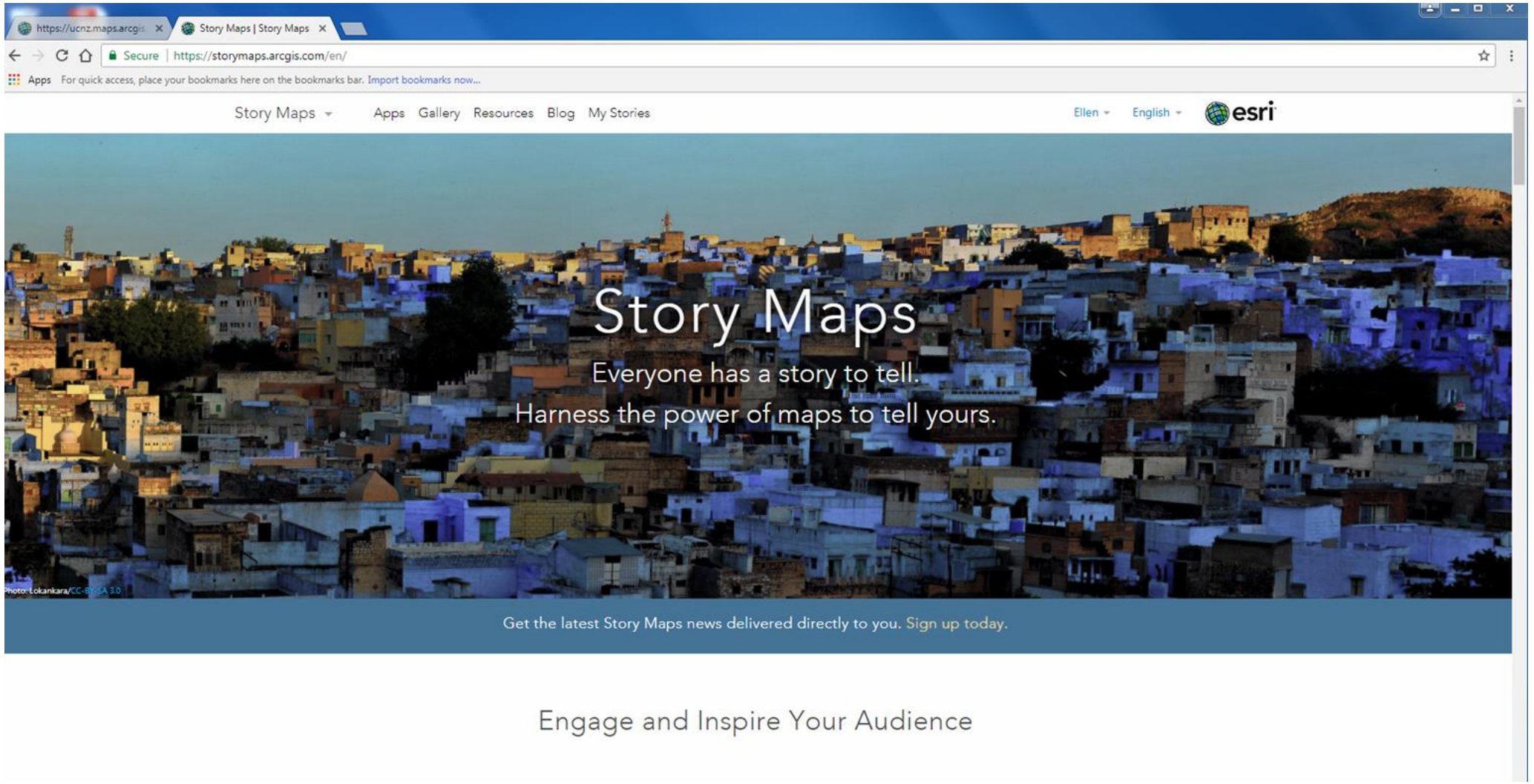


The Power of Terrain Analysis Using Digital Elevation Models

- Define terrain flow accumulation threshold (when is a stream a stream?)
- Add stream order information to drainage lines
- Create buffer based on each stream order and combine
- Perform terrain analysis on any river catchment using only a digital elevation model and the location of any river source

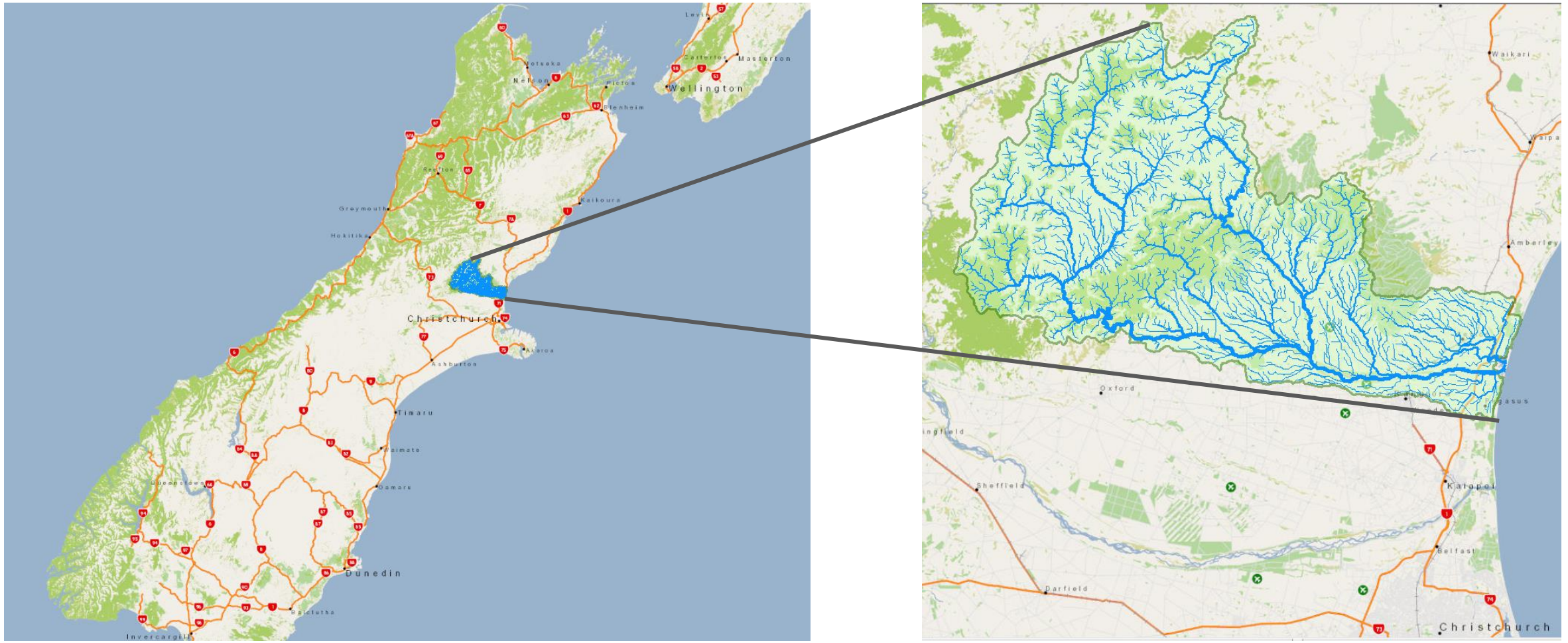


Presenting Using Esri Story Maps

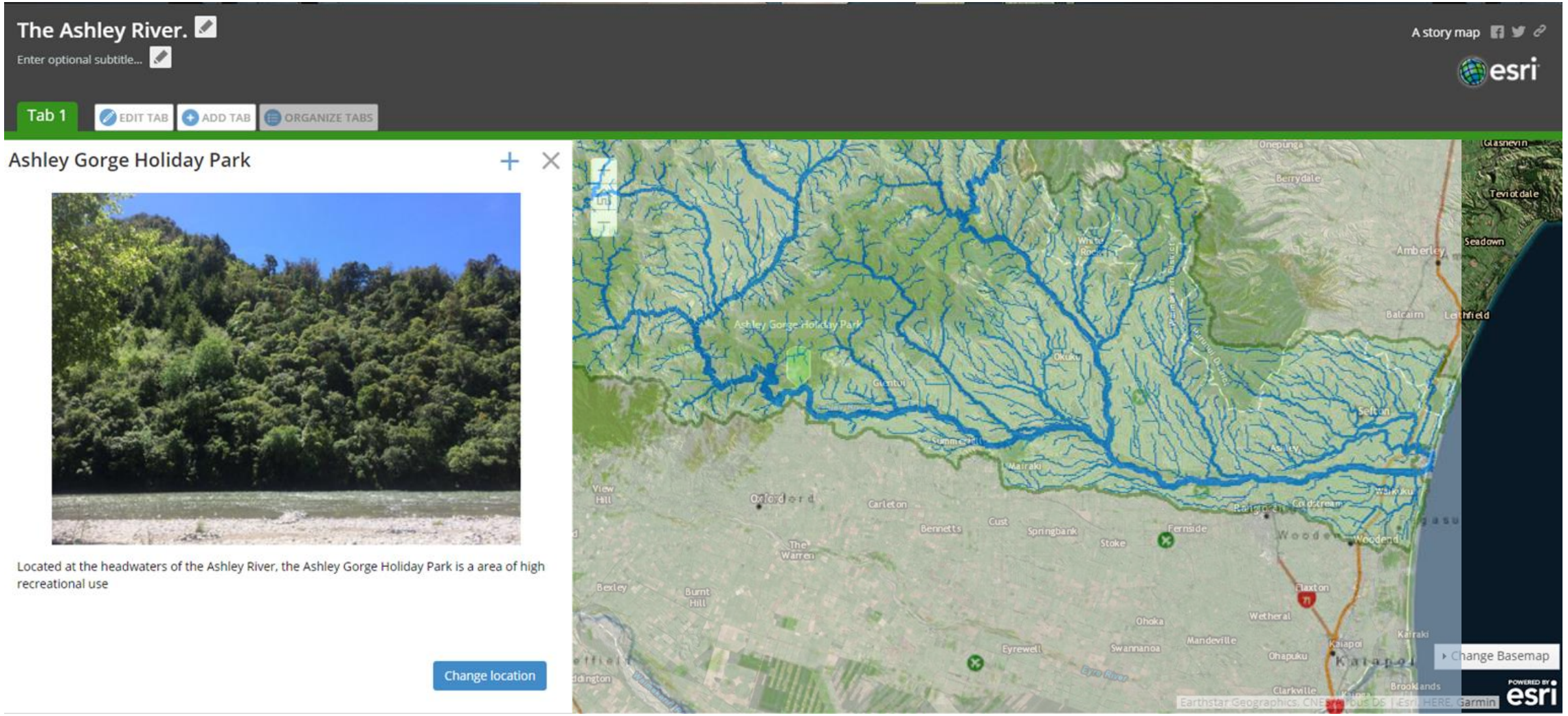


By Ellen Williamson & Sarah Giles

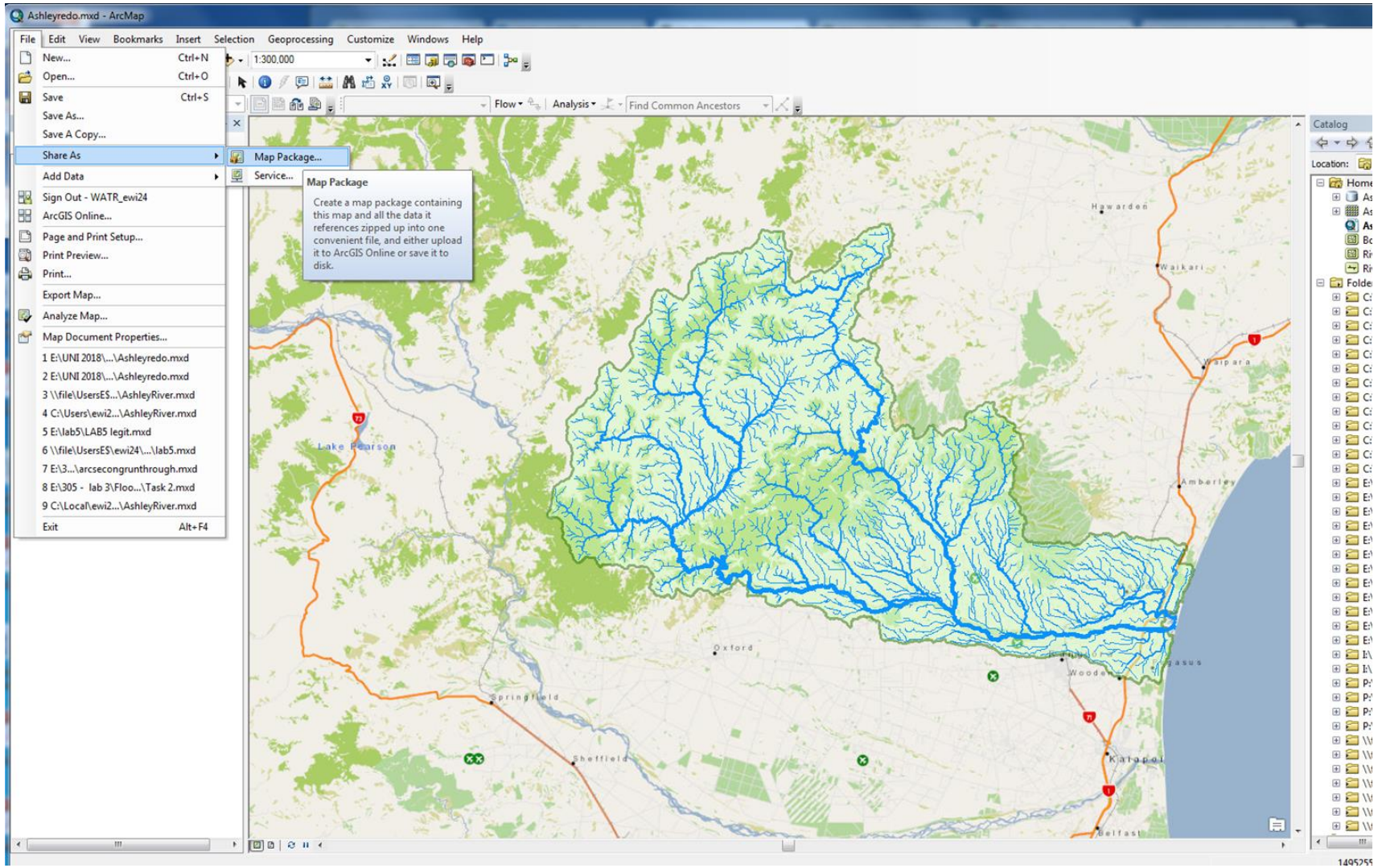
The Ashley River/Rakahuri Catchment



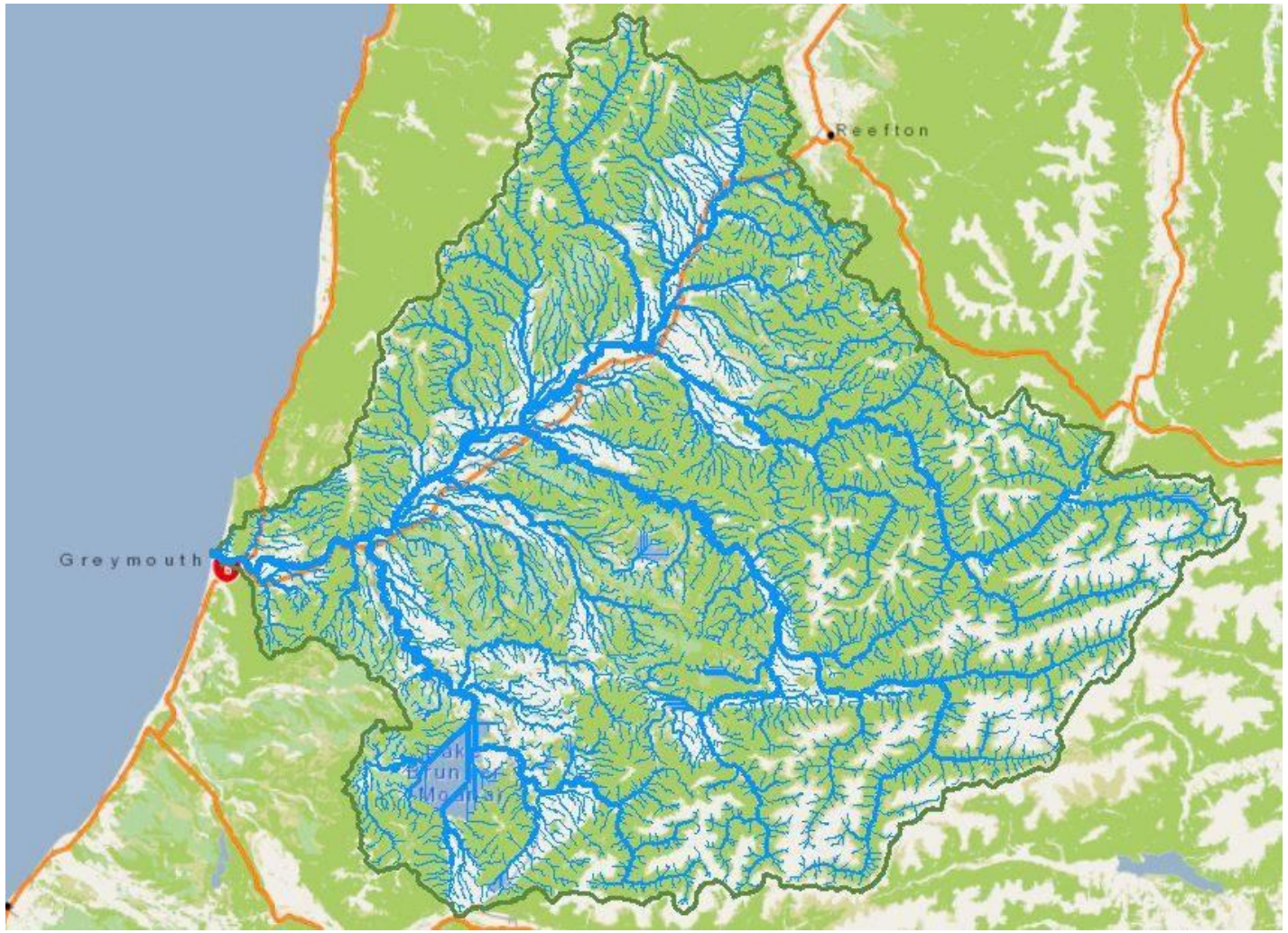
The Ashley River/Rakahuri Catchment using Story Maps



Uploading Basemaps to use in Story Map

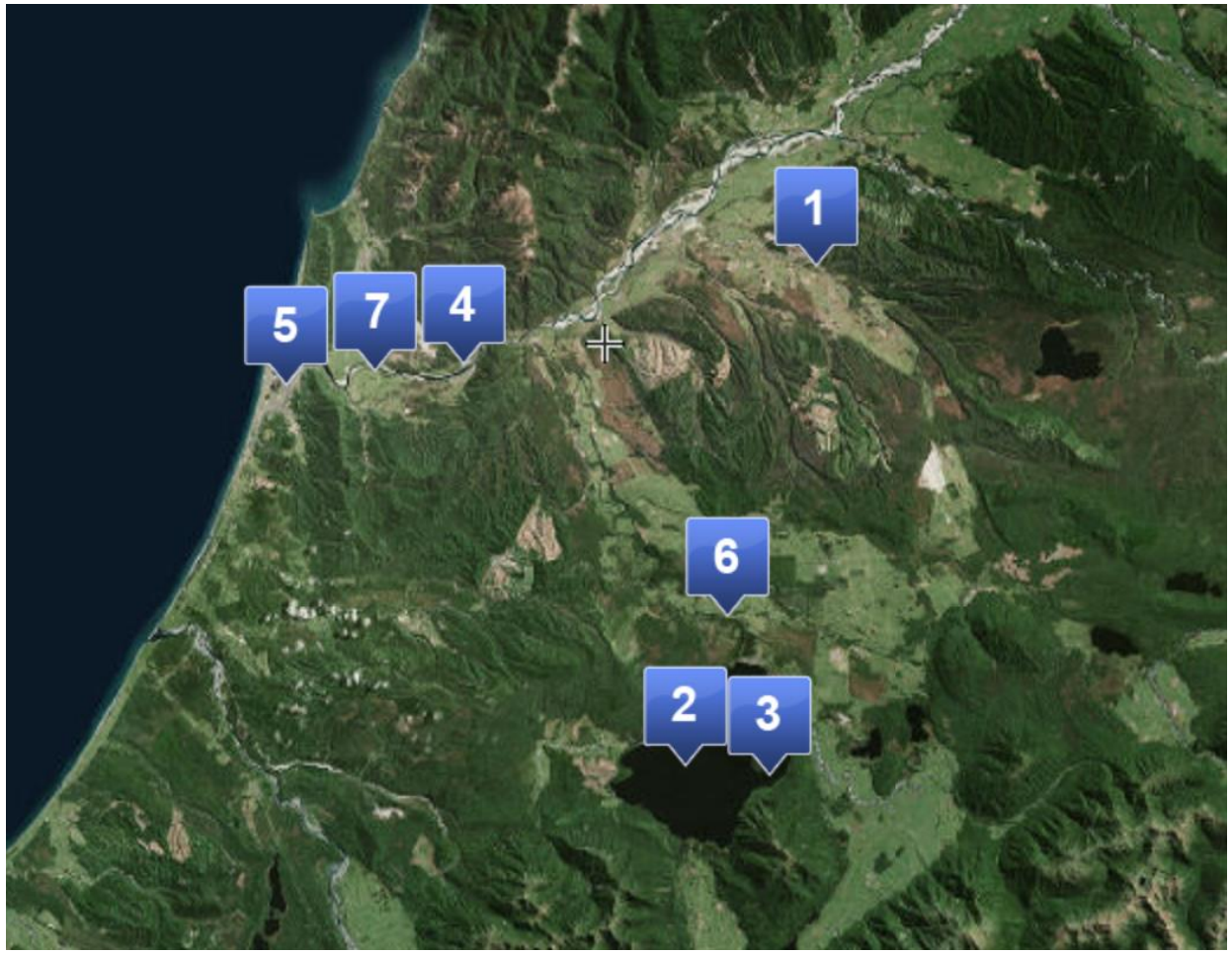


Grey River Catchment



Areas of Focus Within Grey River Catchment

1. Nelson Creek Swimming Hole Reserve
2. Lake Brunner/Moana
3. Lake Brunner at Iveagh Bay
4. Taylorville Swimming Hole
5. Sawyers Creek at Dixon Park
6. Molloy Creek at railway line
7. Grey River before meeting Tasman Sea



Story Map Application