

Introduction to River Architect



Sebastian Schwindt

sschwindt@ucdavis.edu | <https://sebastian-schwindt.org>

Kenneth Larrieu

kglarrieu@ucdavis.edu | <https://kglarrieu.github.io>

Prof. Gregory B. Pasternack lab – <http://pasternack.ucdavis.edu>

Department of Land, Air, and Water Resources
239 Veihmeyer Hall, University of California, Davis
Davis, CA 95616-8628

Getting started

Davis, CA | November 21, 2019

Getting started

1. Go to <https://riverarchitect.github.io> & navigate to the Wiki [2 min.]

2. Get familiar with the Wiki pages [3 min.]

- Find module pages
- Troubleshooting?
- Looking for keywords?

3. Install River Architect [10 min.]

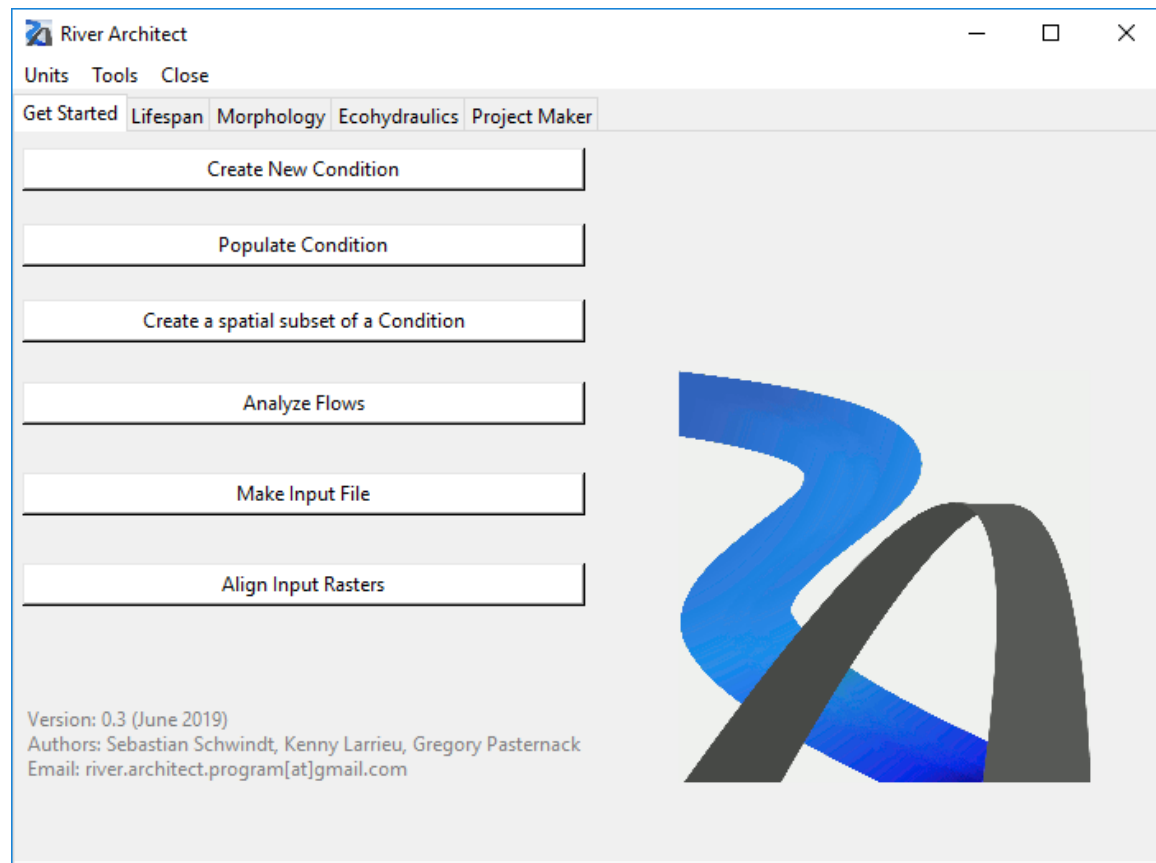
- Check requirements
- Install using Git Bash (Wiki instructions or download River Architect as zip - deprecated)
- After installation: Check folder & file structure (compare with wiki)

4. Launch River Architect [5 min.]

- Prepare first start (https://riverarchitect.github.io/RA_wiki/Installation#launch_ra)
- Launch program & toggle through tabs, check drop-down menus



Getting started



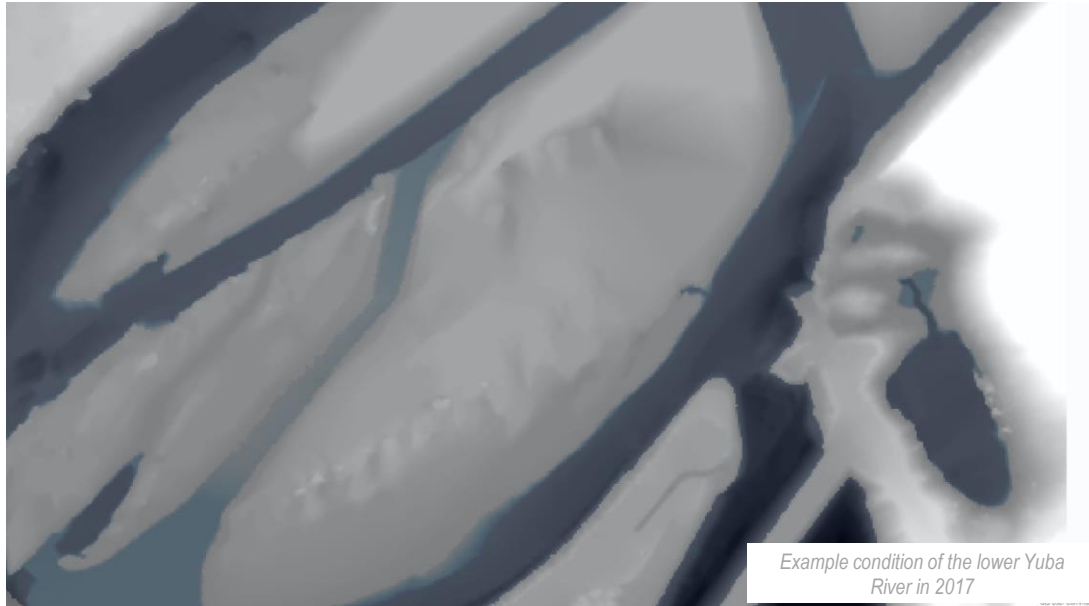
Get started

Launch RA

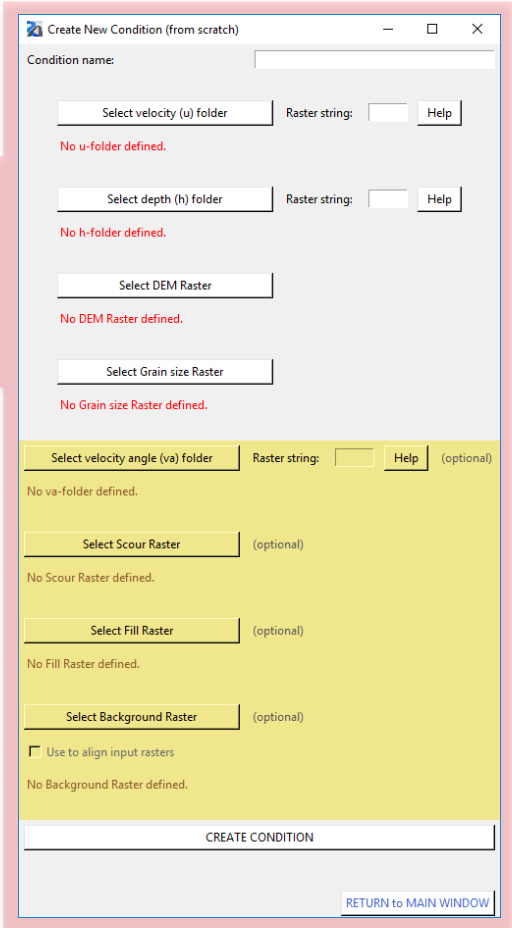
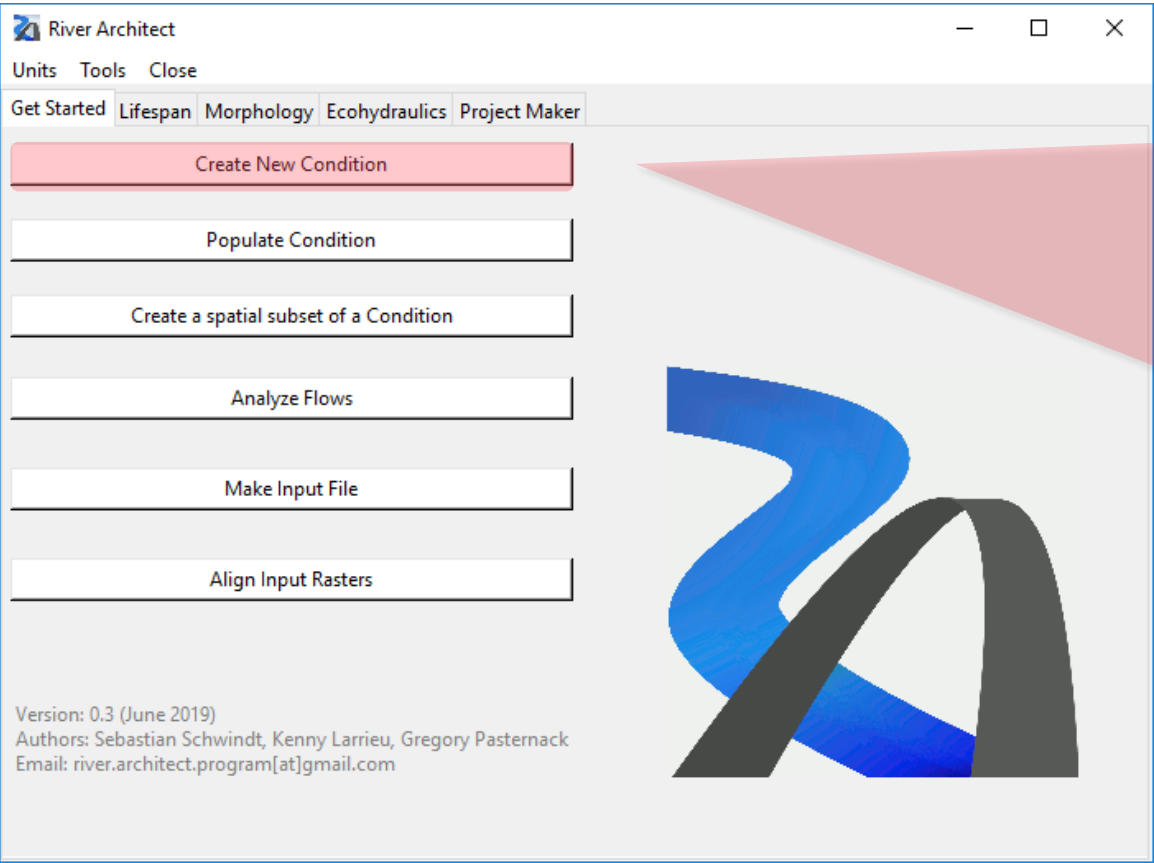
Getting started

Conditions in River Architect

- Snapshot of river topography, sedimentology & hydraulic properties
- Stored in /01_Conditions/
- Looks empty ? ... let's create a new Condition with the sample data ...



Getting started



Get started

Create Condition

Getting started

1) Name for initial condition – be precise, no space (e.g., 2017_initial)

2) Select copied folder from

Z:\resources\Software\2_Geo\RiverArchitect\workshop_data\velocity\

Only use rasters with "initial" in their file name z

3) Repeat 2) for depth rasters:

Z:\resources\Software\2_Geo\RiverArchitect\workshop_data\depth\

4) Select DEM & Grain size raster:

Z:\resources\Software\2_Geo\RiverArchitect\workshop_data\terrain\initial\

5) Select background Raster:

Z:\resources\Software\2_Geo\RiverArchitect\workshop_data\terrain\initial\

6) Create Condition & Verify 01_Conditions/ folder

7) Repeat steps 1)-6) to create another “remod” Condition

Create New Condition (from scratch)

Condition name:

Select velocity (u) folder Raster string: Help

No u-folder defined.

Select depth (h) folder Raster string: Help

No h-folder defined.

Select DEM Raster

No DEM Raster defined.

Select Grain size Raster

No Grain size Raster defined.

Select velocity angle (va) folder Raster string: Help (optional)

No va-folder defined.

Select Scour Raster (optional)

No Scour Raster defined.

Select Fill Raster (optional)

No Fill Raster defined.

Select Background Raster (optional)

☐ Use to align input rasters

No Background Raster defined.

CREATE CONDITION

RETURN to MAIN WINDOW



Get started

Create Condition

Getting started

Create New Condition (from scratch)

Condition name:

Select velocity (u) folder Raster s

No u-folder defined.

Select depth (h) folder Raster s

No h-folder defined.

Select DEM Raster

No DEM Raster defined.

Select Grain size Raster

No Grain size Raster defined.

Select velocity angle (va) folder Raster string: Help (optional)

No va-folder defined.

Select Scour Raster (optional)

No Scour Raster defined.

Select Fill Raster (optional)

No Fill Raster defined.

Select Background Raster (optional)

☐ Use to align input rasters

No Background Raster defined.

CREATE CONDITION

RETURN TO MAIN WINDOW

River Architect

Object Maker

Analyze Flows

Version: 0.3 (June 2019)
Authors: Sebastian Schwindt, Kenny Larrieu, Gregory Pasternack
Email: river.architect.program[at]gmail.com

WARNING

Input rasters are not properly aligned (see logfile). Rasters can be aligned by inputting a background raster and selecting the checkbox "Use to align input rasters", or by using the "Align Input Rasters" tool from the GetStarted menu.

OK

Info

River Architect must be restarted in order to finalize register dataset.
Please confirm closing River Architect?

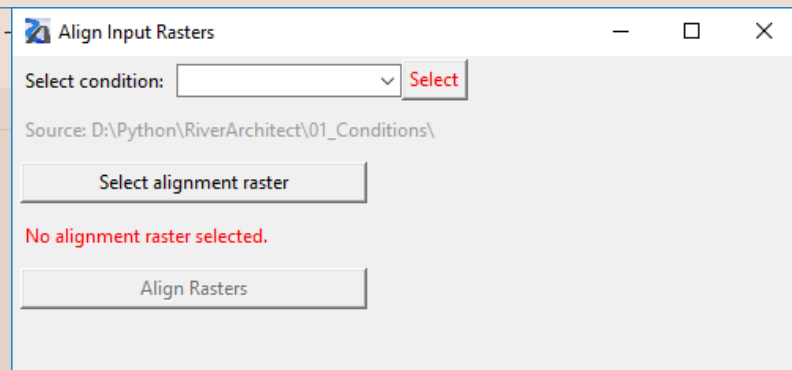
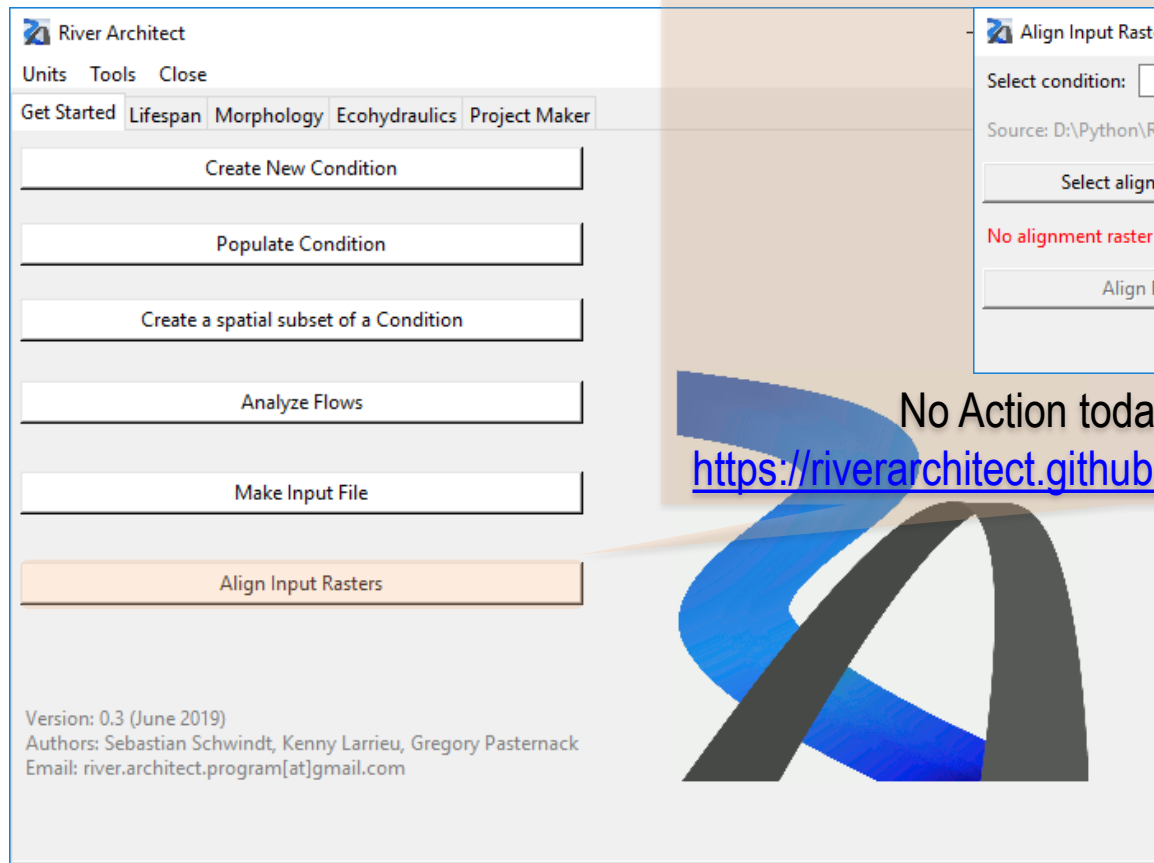
Yes No



Get started

Create Condition

Getting started



No Action today – Kenny & the Wiki tell you more
https://riverarchitect.github.io/RA_wiki/Signposts#align-inputs



Get started

Raster Alignment

Get started

The rasters were copied, but: https://riverarchitect.github.io/RA_wiki/Signposts#terms

Name	Date modified	Type	Size
hd000530_initial.tfw	11/18/2019 11:07 ...	TFW File	1 KB
hd000530_initial.tif	11/18/2019 11:07 ...	TIF File	1,795 KB
hd000530_initial.tif.aux.xml	11/18/2019 11:07 ...	ProjectLibre	2 KB
hd000622_initial.tfw	11/18/2019 11:07 ...	TFW File	1 KB
hd000622_initial.tif	11/18/2019 11:07 ...	TIF File	1,795 KB
hd000622_initial.tif.aux.xml	11/18/2019 11:07 ...	ProjectLibre	2 KB
hd000730_initial.tfw	11/18/2019 11:07 ...	TFW File	1 KB
hd000730_initial.tif	11/18/2019 11:07 ...	TIF File	1,795 KB
hd000730_initial.tif.aux.xml	11/18/2019 11:07 ...	ProjectLibre	2 KB
hd000815_initial.tfw	11/18/2019 11:07 ...	TFW File	1 KB
hd000815_initial.tif	11/18/2019 11:07 ...	TIF File	1,795 KB
hd000815_initial.tif.aux.xml	11/18/2019 11:07 ...	ProjectLibre	2 KB
hd000880_initial.tfw	11/18/2019 11:07 ...	TFW File	1 KB
hd000880_initial.tif	11/18/2019 11:07 ...	TIF File	1,795 KB
hd000880_initial.tif.aux.xml	11/18/2019 11:07 ...	ProjectLibre	2 KB

```
def main():  
    # VARIABLES - MAKE CHANGES HERE  
    prefix_org = "d"  
    prefix_new = "h"  
    suffix_org = "_suffix"  
    suffix_new = ""  
    file_type = ".tif"  
    condition_name = "2017"
```

Does not match River Architect **filename conventions**

- Depth: hQQQQQQQ.tif
- Velocity: uQQQQQQQ.tif

So what - rename 100 files manually ? 🤔
→ Check out River Architect Tools:
RiverArchitect/Tools/rename_files.py
→ Open with IDLE (ArcGIS standard tool)

Define prefix_org = "hd", prefix_new = "h", suffix_org = "_remod", suffix_new = "", condition_name = "2017_remod"
→ Run script (press F5 or click Run > Run Module)
→ Repeat for velocity (change: prefix_org = "uv", prefix_new = "u")
→ Repeat both depth & velocity for init. Condition (change: suffix_org = "_initial", condition_name = "2017_i...")



Getting started

River Architect
Units Tools Close

Get Started Lifespan Morphology Ecohydraulics Project Maker

Create New Condition

Populate Condition

Create a spatial subset of a Condition

Analyze Flows

Make Input File

Align Input Rasters

Version: 0.3 (June 2019)
Authors: Sebastian Schwindt, Kenny Larrieu, Gregory Pasternack
Email: river.architect.program[at]gmail.com

Populate Condition

Units

Select condition: 2017_bbp_org
2017_brb_chju
2017_brb_org

Validate

Select a condition.

Create Depth to Groundwater Raster (d2w.tif)

Select minimum flow depth raster

Run d2w creation

Interpolation method: IDW

Create detrended DEM Raster (dem_detrend.tif)

Select minimum flow depth raster

Run detrended DEM creation

Create Morphological Unit Raster (mu.tif)

Select depth raster

Select velocity raster

Run MU creation

View / change MU definitions

Currently selected Raster unit system: U.S. customary

RETURN to MAIN WINDOW



Get started

Populate Condition

Getting started

- 1) Select remod condition
- 2) Create d2w.tif with 530-cfs raster
- 3) Create detrended_dem.tif with 530-cfs raster
- 4) Create mu.tif with 880-cfs rasters

Read more

https://riverarchitect.github.io/RA_wiki/Signposts#populate-condition

Populate Condition

Units

Select condition:

2017_bbp_org

2017_brb_chju

2017_brb_org

^

v

Validate

Select a condition.

Create Depth to Groundwater Raster (d2w.tif)

Select minimum flow depth raster

Run d2w creation

Interpolation method:

IDW

v

Create detrended DEM Raster (dem_detrend.tif)

Select minimum flow depth raster

Run detrended DEM creation

Create Morphological Unit Raster (mu.tif)

Select depth raster

Select velocity raster

Run MU creation

View / change MU definitions

Currently selected Raster unit system: U.S. customary

RETURN to MAIN WINDOW



Getting started

The screenshot displays the 'River Architect' software interface. The main window has a menu bar with 'Units', 'Tools', and 'Close'. Below it are tabs for 'Get Started', 'Lifespan', 'Morphology', 'Ecohydraulics', and 'Project Maker'. The 'Get Started' tab is active, showing a vertical list of buttons: 'Create New Condition', 'Populate Condition', 'Create a spatial subset of a Condition', 'Analyze Flows' (highlighted in pink), 'Make Input File', and 'Align Input Rasters'. A red arrow points from the 'Analyze Flows' button to the 'Analyze Discharge' dialog box. The dialog box has a title bar with a close button. It contains two sections: '1) Analyze a Condition' and '2) Generate Flow Duration Curves'. In the first section, a dropdown menu shows '2014', '2014_ugb_org', and '2017', with an 'Analyze' button to the right. Below this is a red instruction: 'Select a condition and press 'Analyze''. In the second section, a dropdown menu shows 'Chinook Salmon - spawning', 'Chinook Salmon - fry', and 'Chinook Salmon - juvenile', with a 'Modify Source' button to the right. Below this is an 'Add' button. At the bottom of the dialog, there are two input fields: 'Select input Flow Series' and 'Make flow duration curve(s)', followed by a 'RETURN to MAIN WINDOW' button. The background of the main window shows a stylized river map with blue and black areas.

River Architect

Units Tools Close

Get Started Lifespan Morphology Ecohydraulics Project Maker

Create New Condition

Populate Condition

Create a spatial subset of a Condition

Analyze Flows

Make Input File

Align Input Rasters

Version: 0.3 (June 2019)
Authors: Sebastian Schwindt, Kenny Larrieu, Gregory Pasternack
Email: river.architect.program[at]gmail.com

Analyze Discharge

1) Analyze a Condition

Select condition: 2014
2014_ugb_org
2017

Analyze

Select a condition and press 'Analyze'.

2) Generate Flow Duration Curves

Add season / target species: Chinook Salmon - spawning
Chinook Salmon - fry
Chinook Salmon - juvenile

Modify Source

Add

Current selection:

Select input Flow Series

Make flow duration curve(s)

RETURN to MAIN WINDOW



Getting started

1) Highlight initial condition and click on Analyze
2) A workbook will open – **use**
Z:\resources\Software\2_Geo\RiverArchitect\workshop_data\flows.xlsx
to define Return periods (frequency sheet)

3) Add Chinook Salmon - juvenile
4) Select input Flow series:
Z:\resources\Software\2_Geo\RiverArchitect\workshop_data\flows.xlsx
(flow data sheet)
5) Click on Make flow duration curve(s)

The screenshot shows the 'Analyze Discharge' dialog box with the following sections and controls:

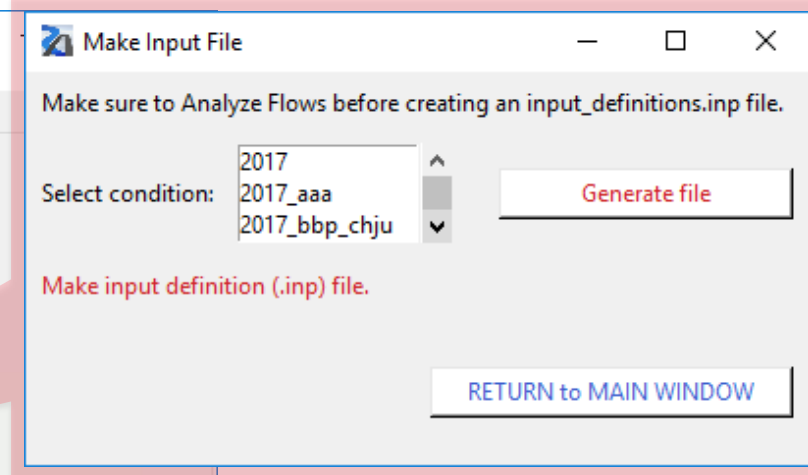
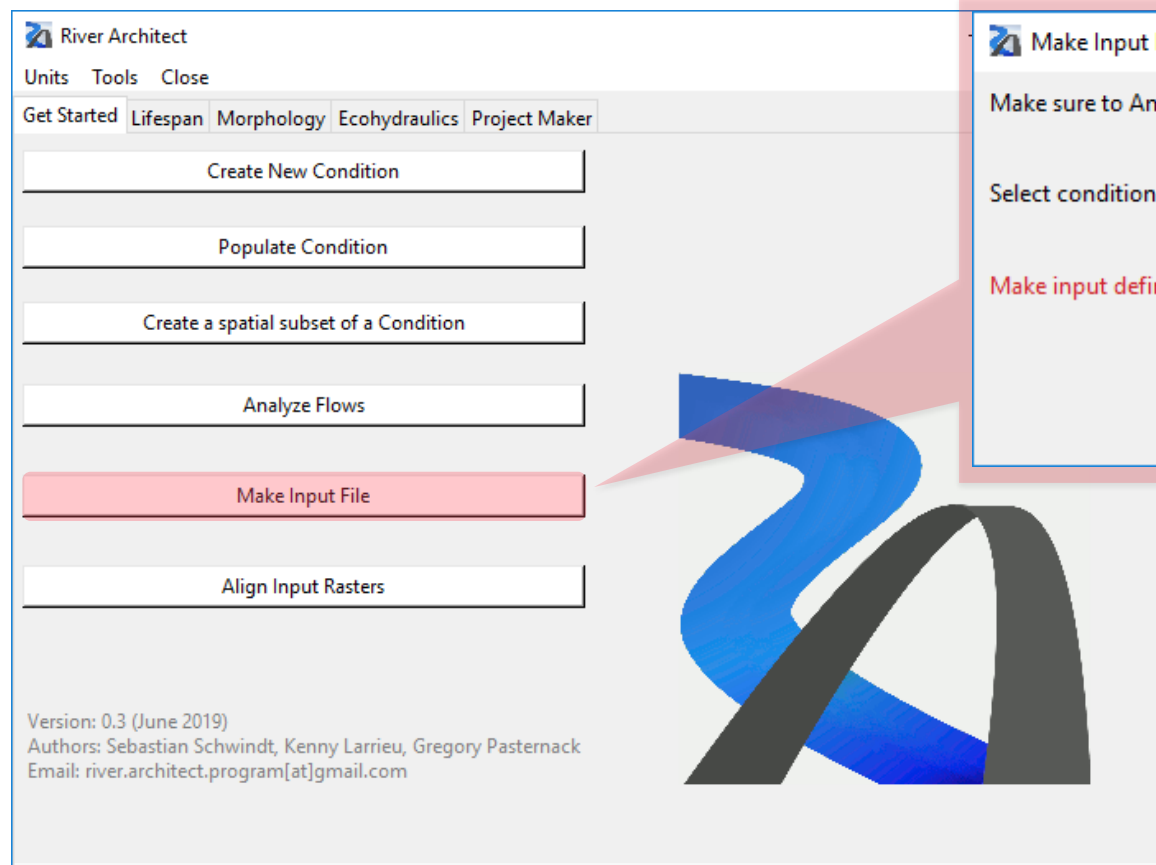
- 1) Analyze a Condition:** A list box containing '2014', '2014_ugb_org', and '2017'. A blue callout points to this list with the text 'Select condition:'. To the right is a red 'Analyze' button.
- Select a condition and press 'Analyze':** A red instruction text.
- 2) Generate Flow Duration Curves:** A section with a 'Modify Source' button.
- Add season / target species:** A list box containing 'Chinook Salmon - spawning', 'Chinook Salmon - fry', and 'Chinook Salmon - juvenile'. A blue callout points to this list with the text 'Add season / target species:'. To the right is an 'Add' button.
- Current selection:** Two input fields. The first is labeled 'Select input Flow Series'. The second is labeled 'Make flow duration curve(s)'. To the right of these fields is a large pink 'RETURN to MAIN WINDOW' button.

6) **Verify new workbooks in RiverArchitect/:**
/00_Flows/INITAL/flow_duration_chju.xlsx & /01_Conditions/INITIAL/flow_definitions.xlsx

7) **Repeat steps 1)-6) to create flow statistics for the “remod” Condition**

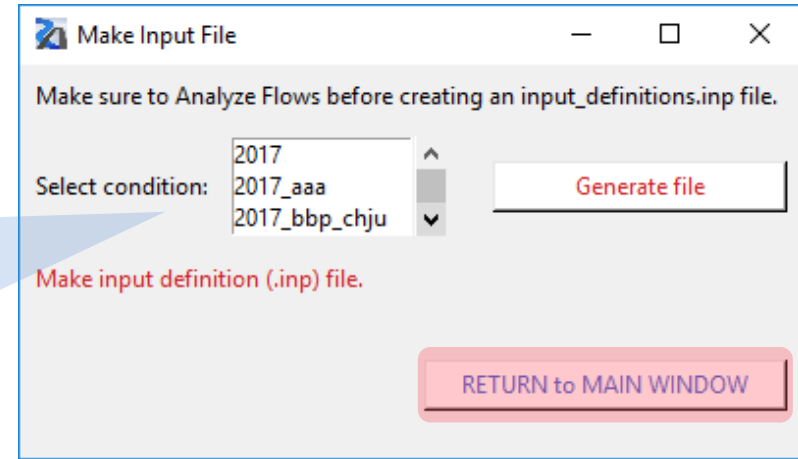


Getting started



Getting started

- Select initial condition & click on Generate file
- Select remod condition & click on Generate file
- Verify input files:
 - /01_Conditions/INITIAL/input_definitions.inp
 - /01_Conditions/REMOD/input_definitions.inp



Main purpose: Lifespan & Design mapping

More about input definition files: https://riverarchitect.github.io/RA_wiki/Signposts#inpfile

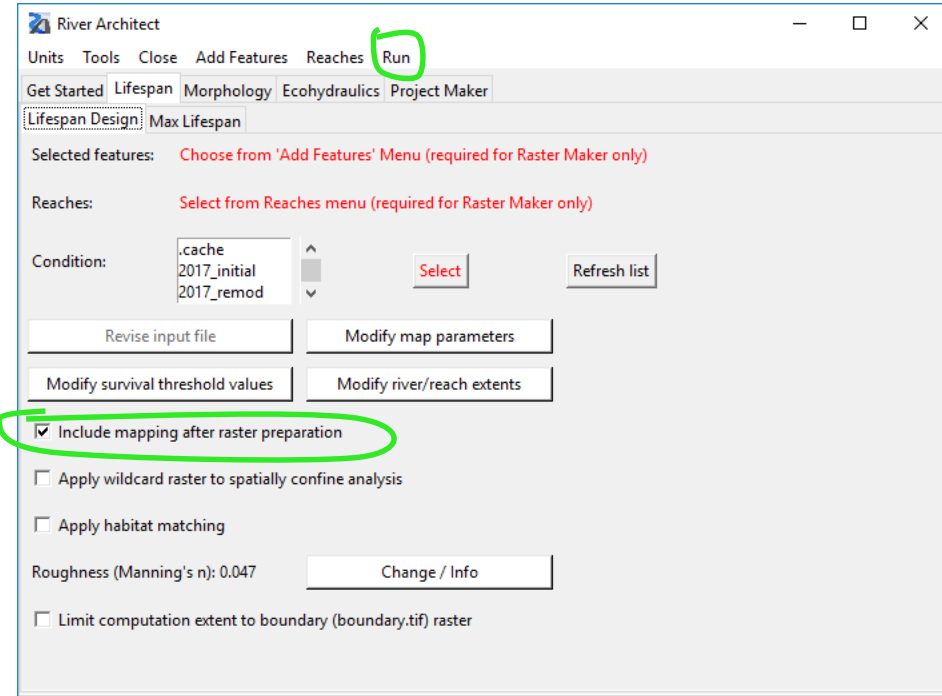


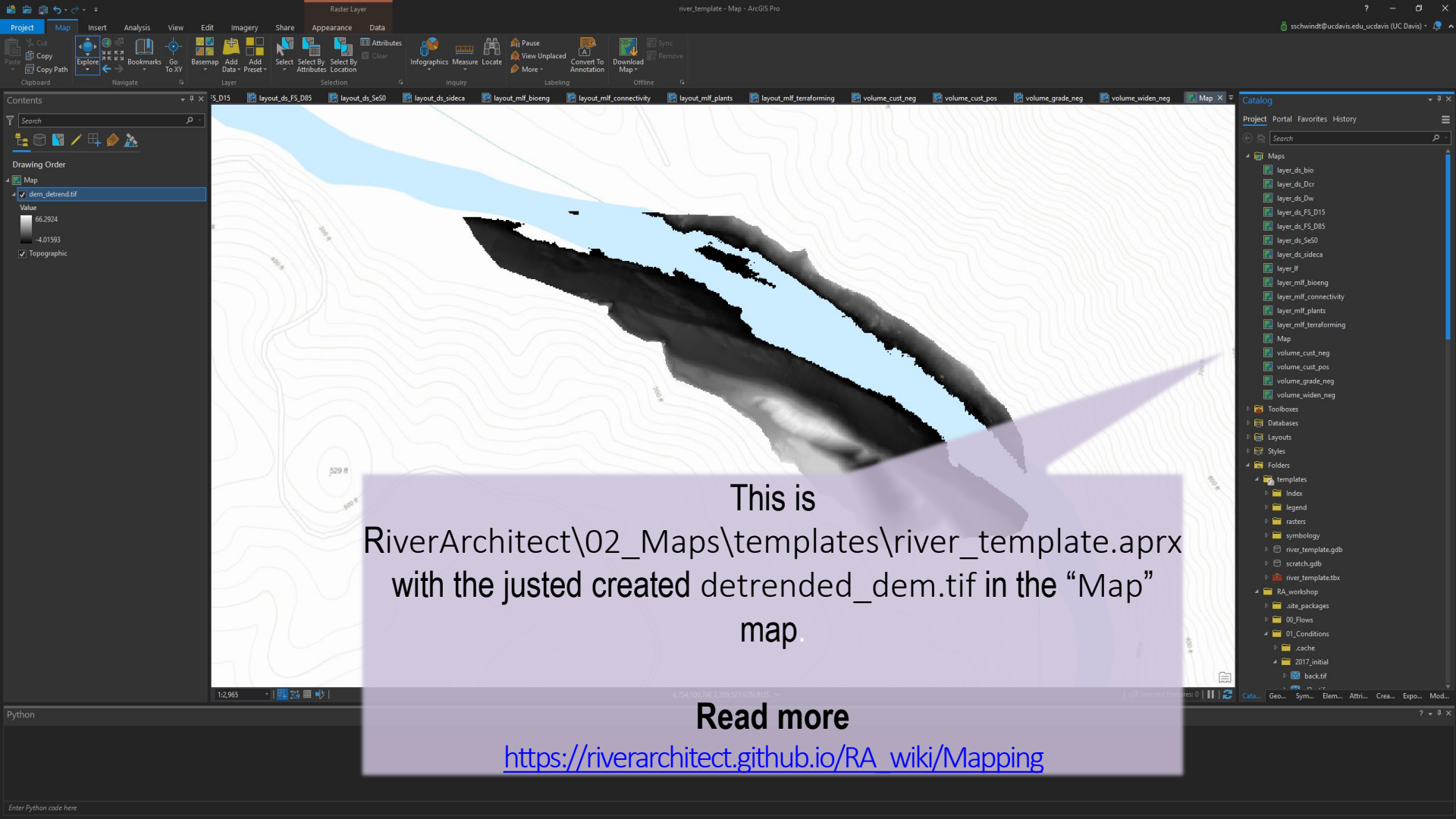
Mapping



Mapping

- Lifespan-modules use RiverArchitect\02_Maps\templates\river_template.aprx for each condition (if activated in River Architect)
- Project Maker module uses RiverArchitect\ProjectMaker\.templates\Project_vii_TEMPLATE\ProjectMaps.aprx
- Projects (.aprx files) contain layout templates for automated map generation





This is
RiverArchitect\02_Maps\templates\river_template.aprx
with the justed created detrended_dem.tif in the “Map”
map.

Read more

https://riverarchitect.github.io/RA_wiki/Mapping

Detailed documentation & reading for this chapter
https://riverarchitect.github.io/RA_wiki/Signposts

