

Review of the Kayaking Expedition Route

*for the 9-Day Singapore Youth
Outdoor (SYO) Programme*

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Agenda



- Organisation
- Problem Statement
- Deliverables
- Data Analysis
- Recommendation
- Q&A

Background



- National Outdoor Adventure Singapore (NOAS)
- Outdoor adventure provider
- 9-days Singapore Youth Outdoor (SYO) Programme for institute of higher learning (IHL) students

SYO Feedback

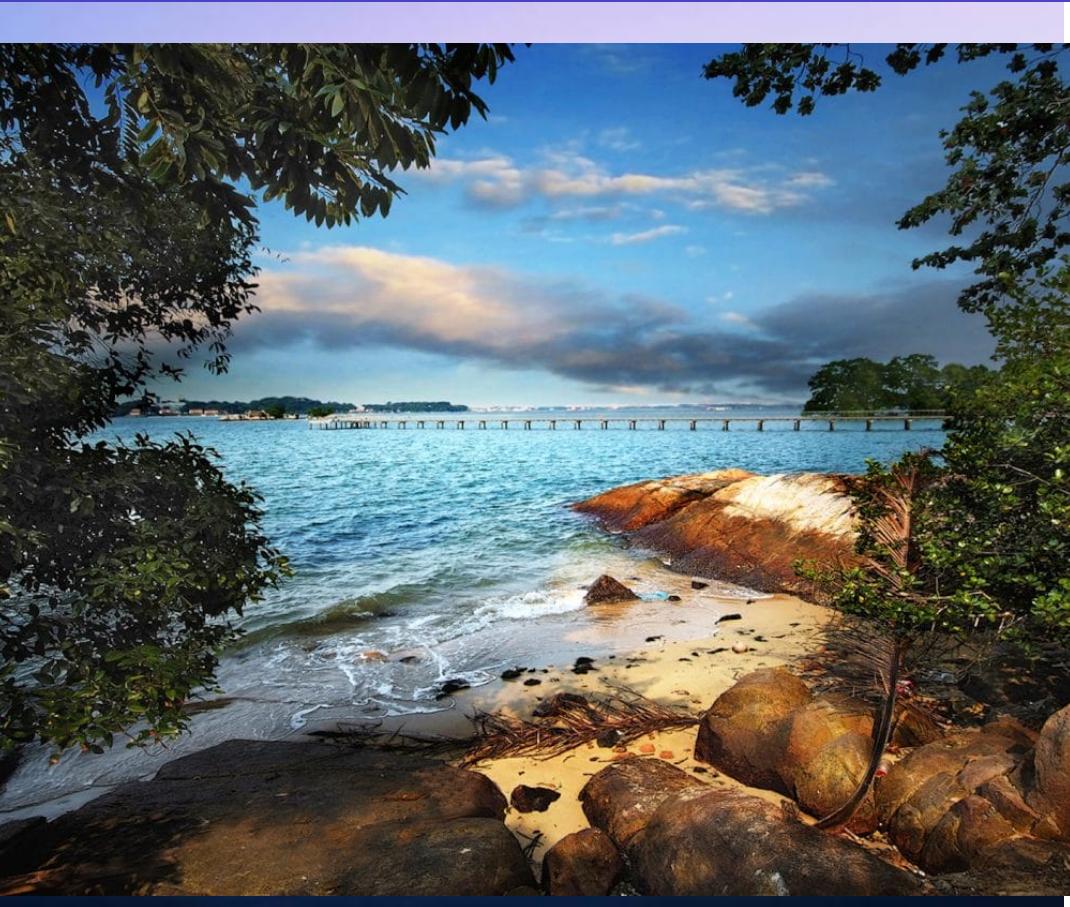
- Kayaking sea expedition route around Pulau Ubin is too easy
- Prefer a longer expedition route that will stretch the students physically, mentally and emotionally

Problem Statement

What is the optimal kayaking expedition route, that is challenging for the students?



Problem Statement



Request

- Review the current sea expedition route which is kayaking around Pulau Ubin

Action Plan

- NOAS Safety Committee Members (SCM) aims to trial the new kayaking sea expedition route from NOAS Pulau Ubin Campus to NOAS East Coast Campus

Expedition Route Map

Current Kayaking Route (*round Pulau Ubin*)



1. Start and end point
2. Distance = 18km
3. Average completion: 6hours

Expedition Route Map

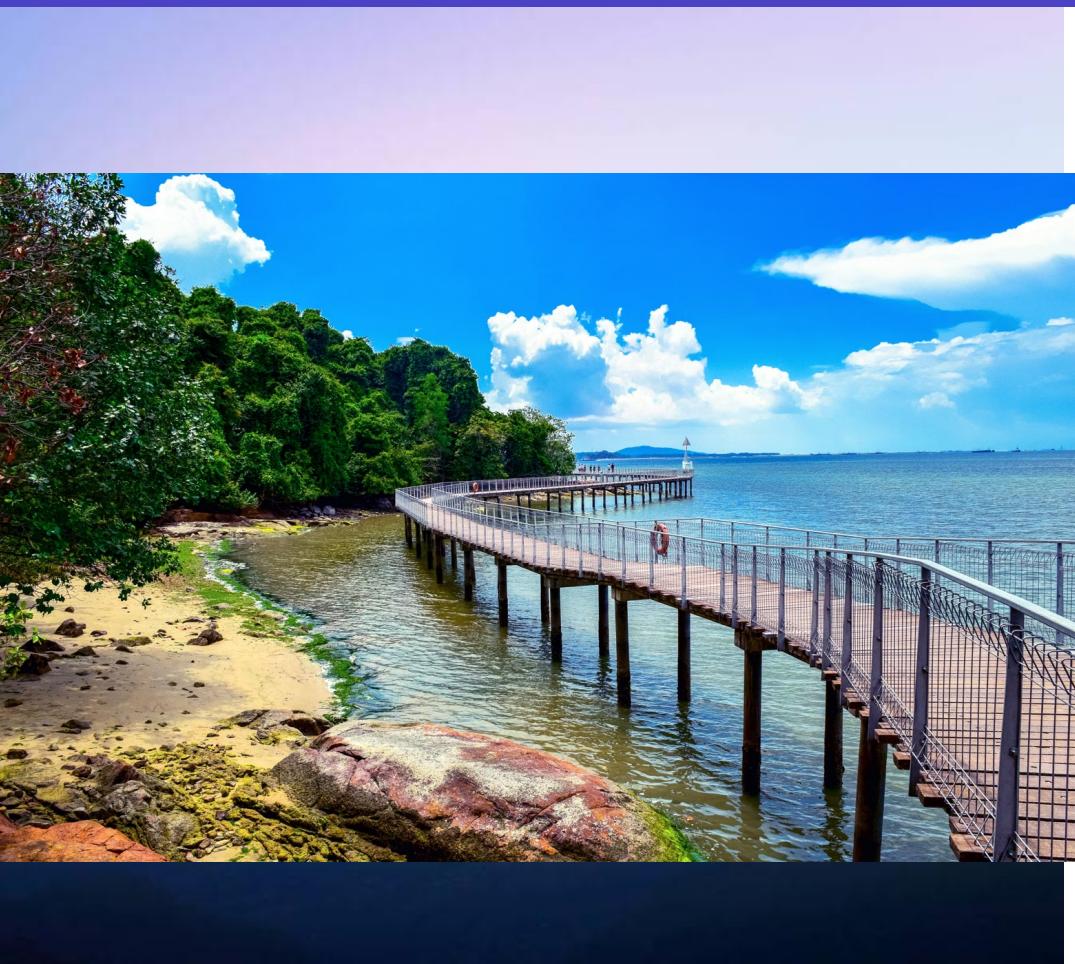
New Trial Route (Pulau Ubin to East Coast)

1. Distance: 33km
2. Projected completion: 10hrs
3. Overnight pit stop: Changi Beach if necessary

Zoom in of East Coast End Point



Considerations & Assumptions



Principal Considerations

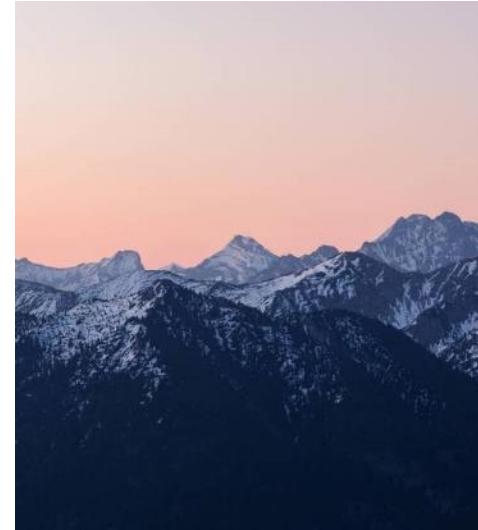
1. Little to minimal rainfall
2. Longer sunshine hours

Assumptions

1. high level of rainfall results in choppy sea conditions, and students cannot manage the potential waves;
2. strong winds during thunderstorms will also pose a challenge for students because they cannot control their kayak effectively; and
3. poor visibility with a heavy rainfall and thunderstorm will affect Instructors ability to provide effective safety management for the students.

Deliverables

Inform the Safety Committee Members **which month is most ideal to conduct the new sea expedition trial route** that is from Pulau Ubin to East Coast Campus (Mainland Singapore).



Exploratory Data Analysis

Rainfall

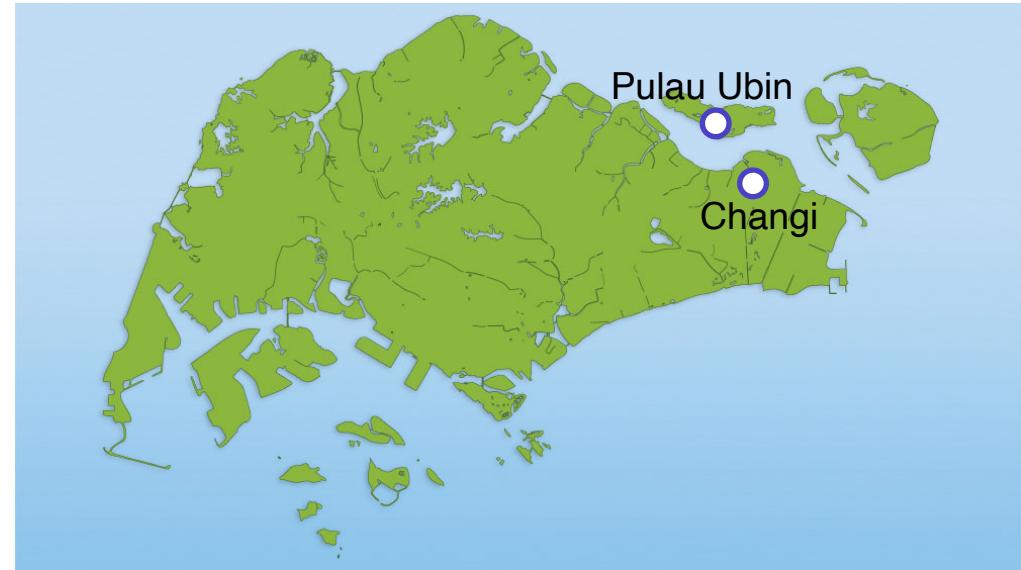
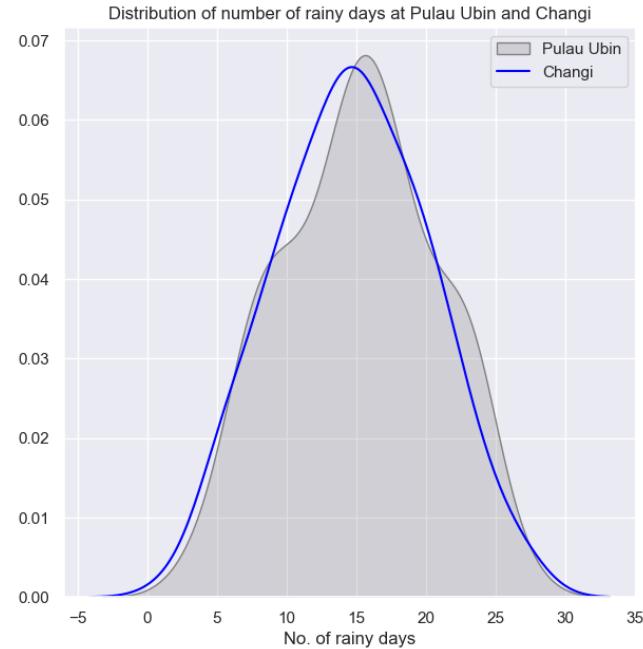
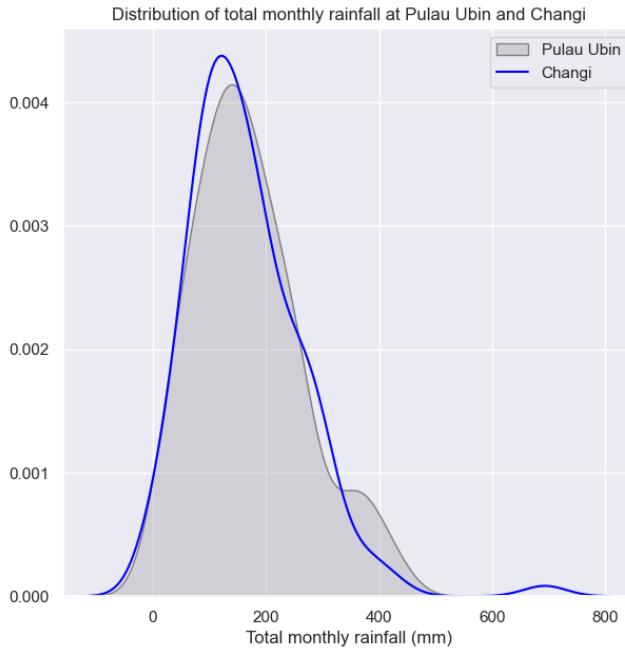
Temperature, Humidity

Tidal



Exploratory Data Analysis

Which month is best to conduct the trial?



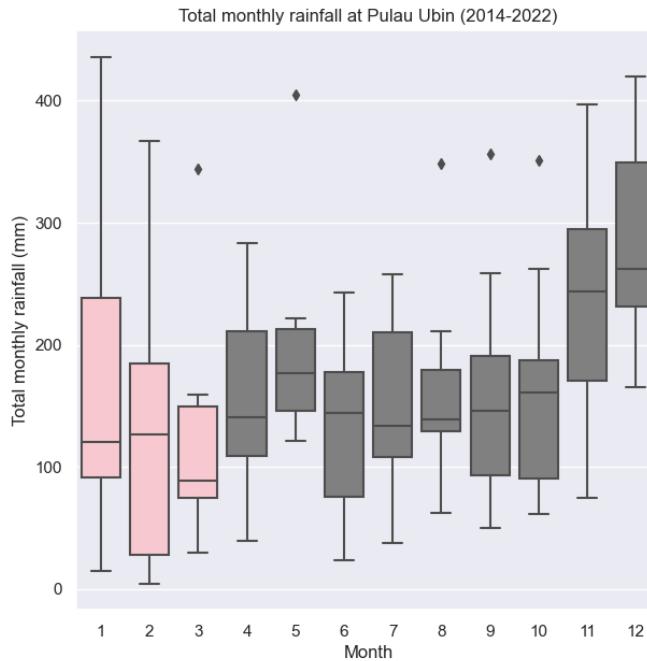
Findings:

Rain behaviours and Pulau Ubin are **similar** due to their close proximity

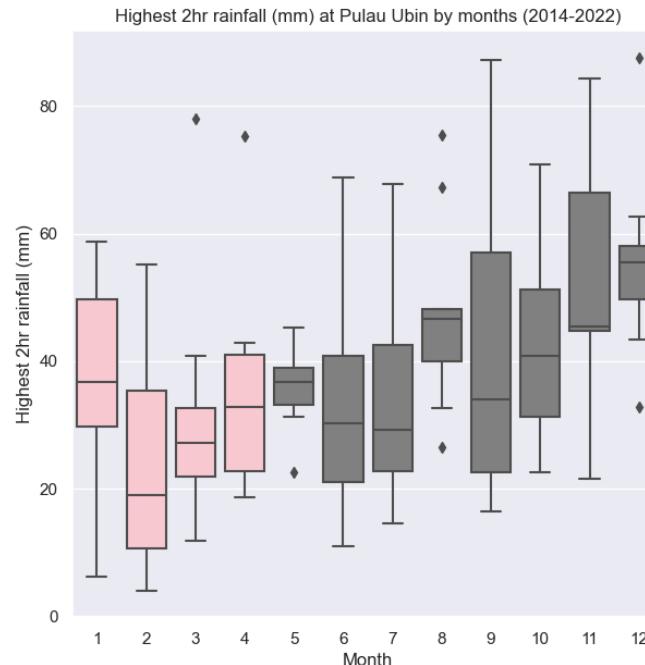
Exploratory Data Analysis

Which month is best to conduct the trial?

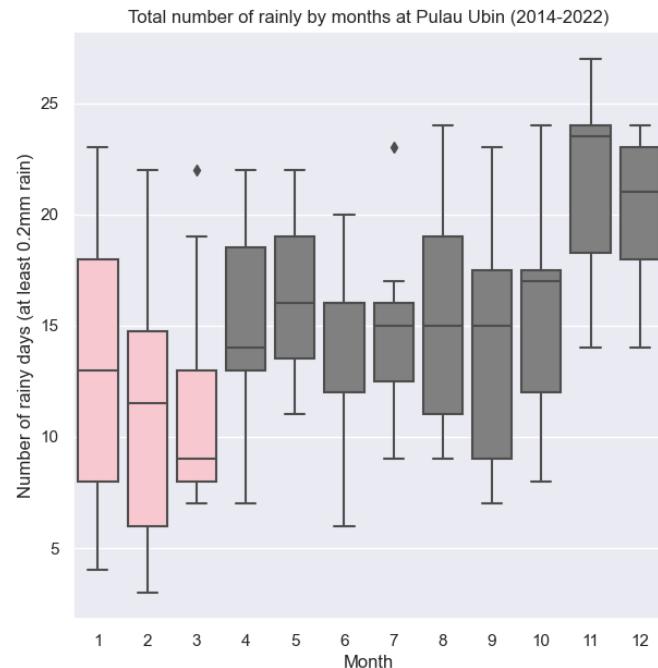
First Chart



Second Chart



Third Chart



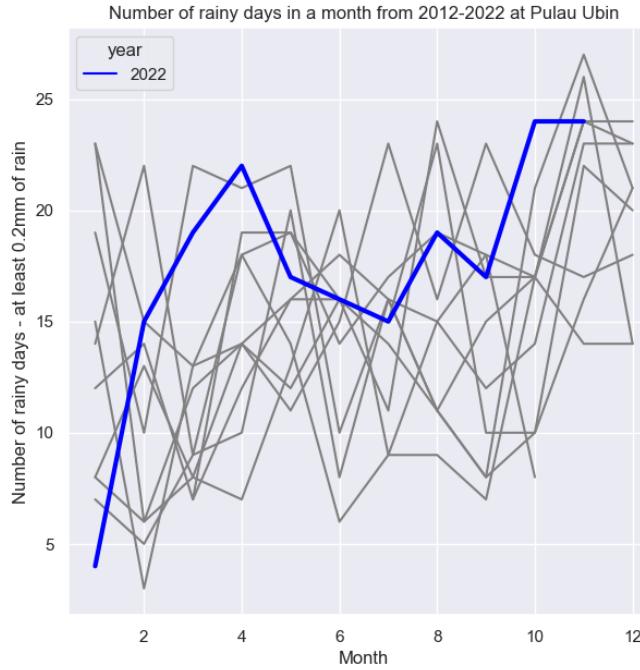
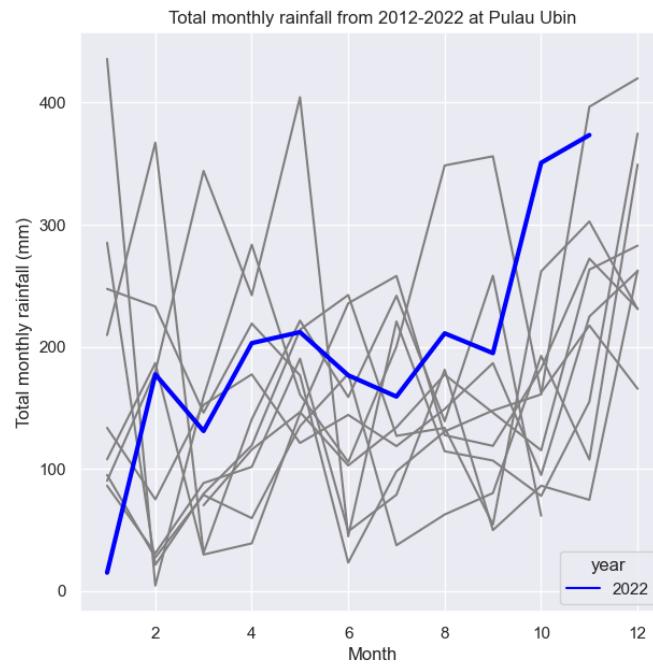
Findings:

From 2014-2022 at Pulau Ubin, **Jan-Mar** generally experience lower total rainfall, less heavy prolonged showers (2hr rainfall), and lesser rainy days:

- about 4mm of rain per day
- About 3mm of prolonged rain
- About 12 days with rain per month

Exploratory Data Analysis

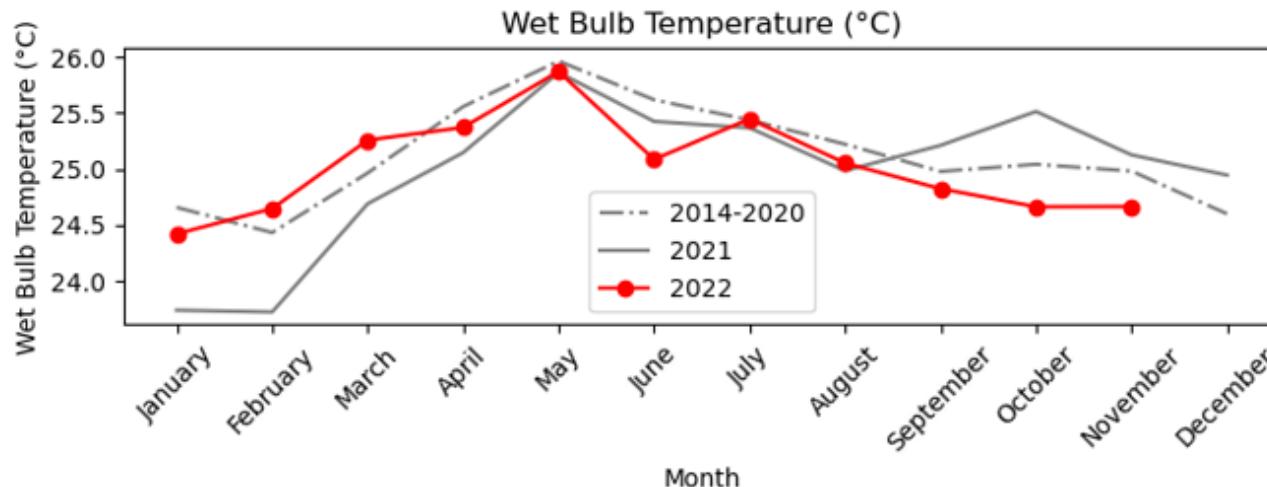
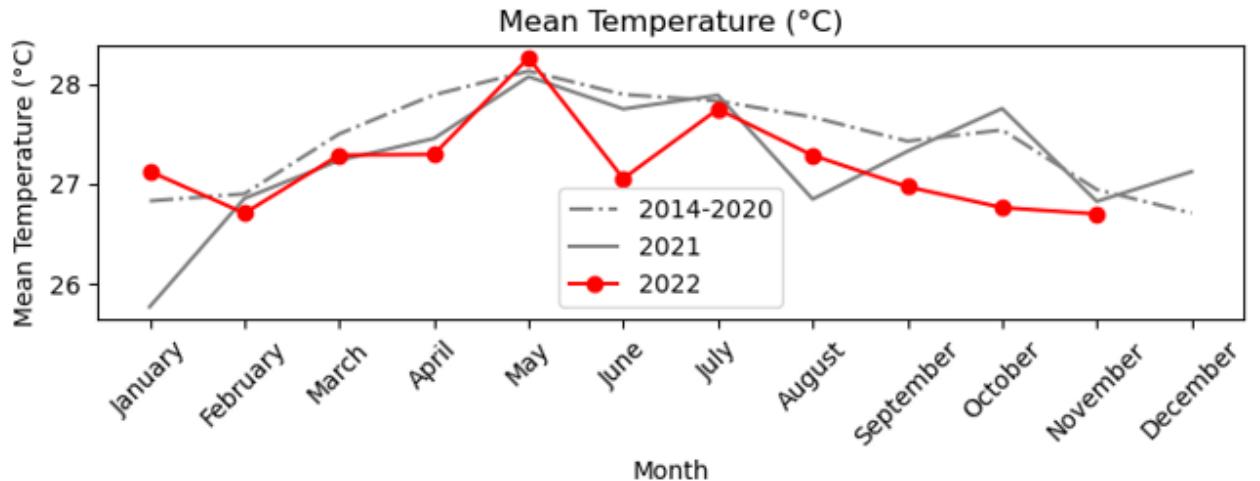
Which month is best to conduct the trial?



Findings:

However, as there are wide variation of rain behaviour across years, we have focused on 2022 data since it most recent. The month with the **lowest rain fall is January**.

Trend of temperature from 2014-2022

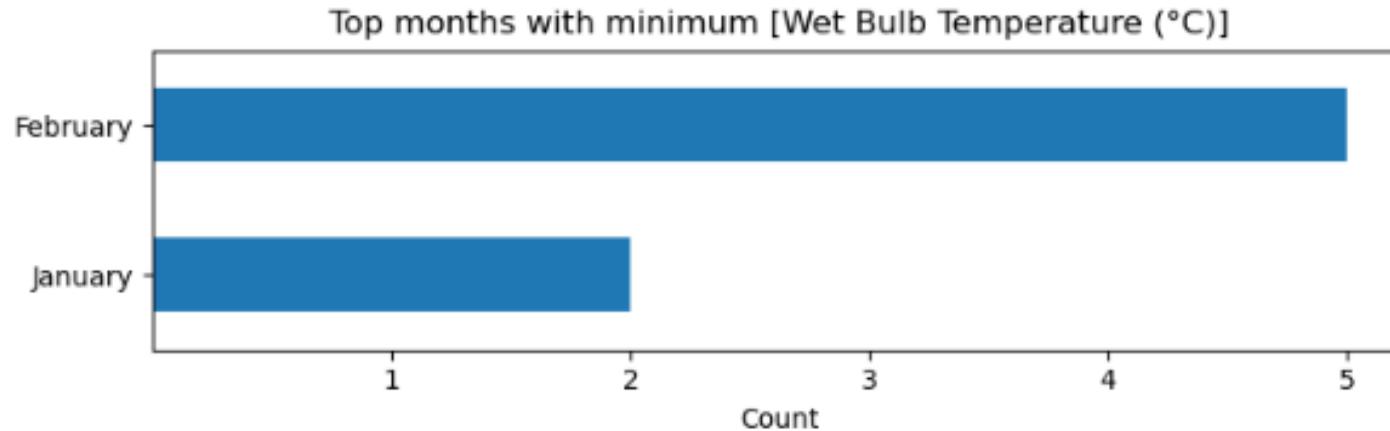


Findings:

1. Mean temperature and wet bulb temperature is lower in months of **January-February and November-December**.
2. There is a dip in temperatures in June 2022.
3. Both mean temperature and wet bulb temperature are positively correlated.

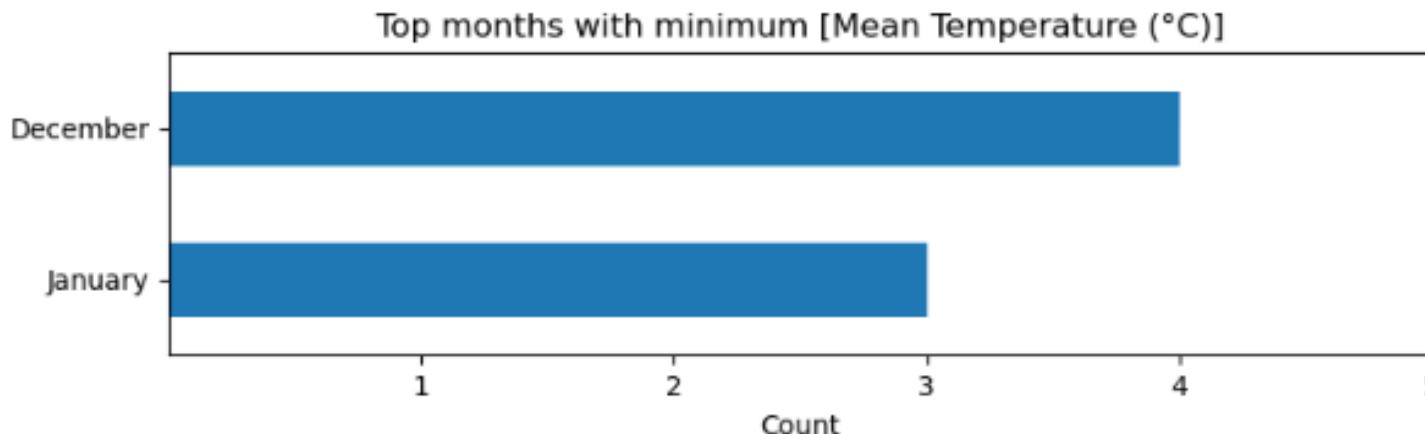
Wet-bulb temperature is a combination of heat and humidity, and reflects the ability for human body to cool down. A low wet-bulb temp is recommended to prevent heat-related injuries during sporting events.

Comparison of months for lowest temperatures

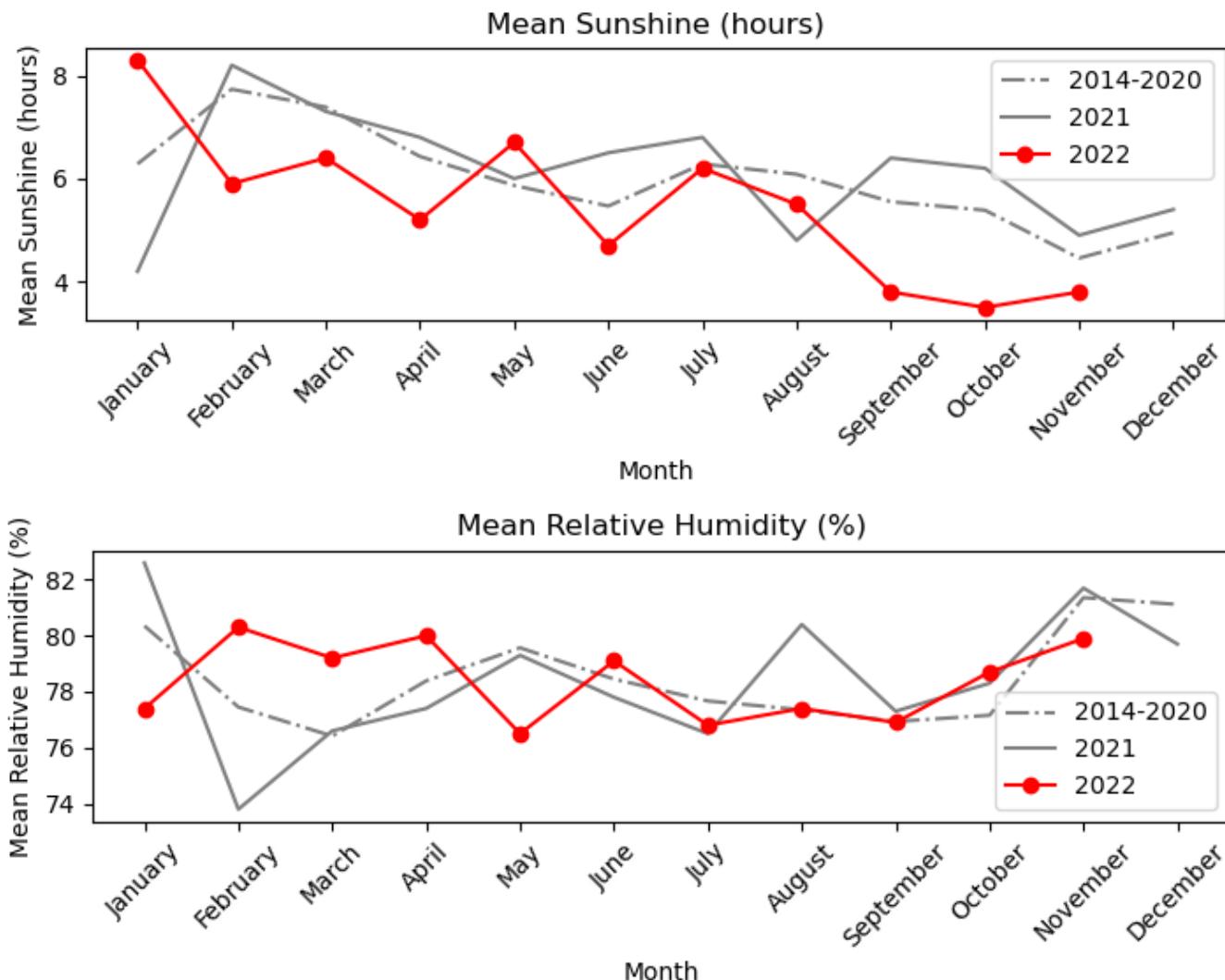


Findings:

1. **January and February** have lowest wet-bulb temperature ideal for outdoors kayaking.



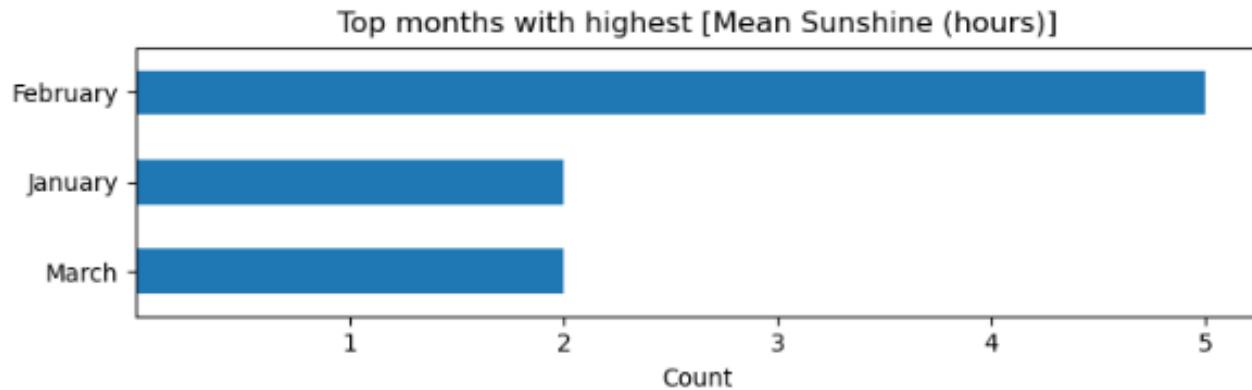
Trend of sunshine and humidity from 2014-2022



Findings:

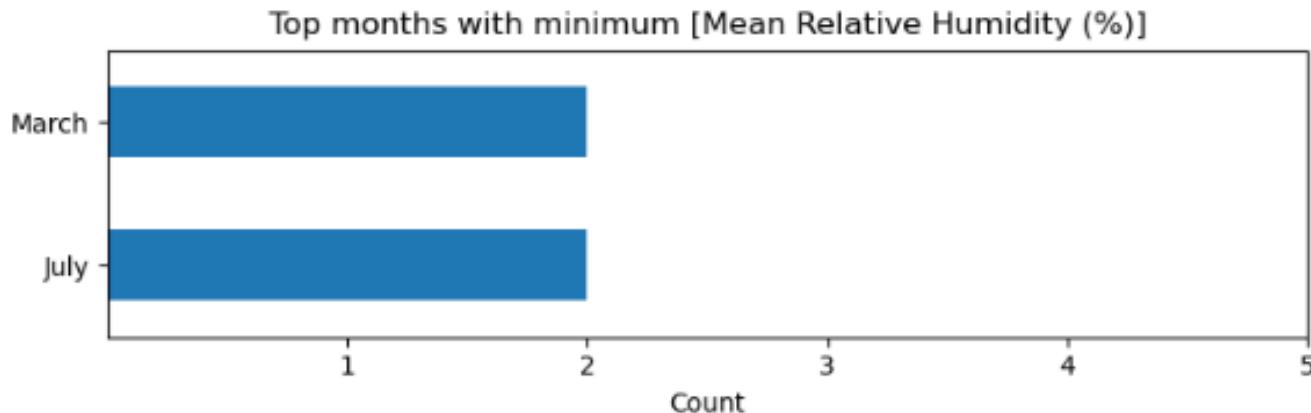
1. Sunshine hours is higher in **January**.
2. Relative humidity is lower in **January**.
3. Both sunshine hours and humidity are negatively correlated e.g. dip in sunshine hours in June 2022 has an **inverse rise** in humidity.

Comparison of months for ideal humidity and sunshine hours



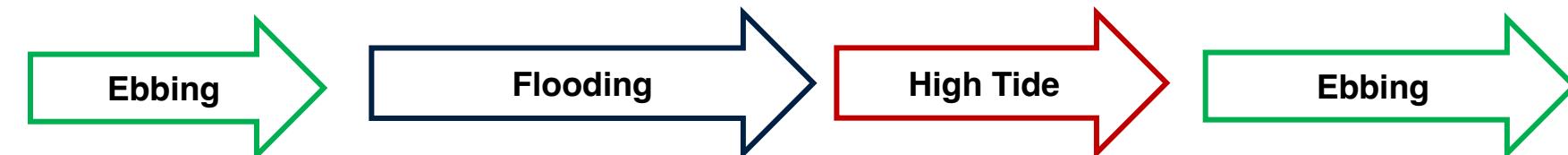
Findings:

1. **January, February and March** have the ideal combination of long sunshine hours and low relative humidity for outdoors kayaking.

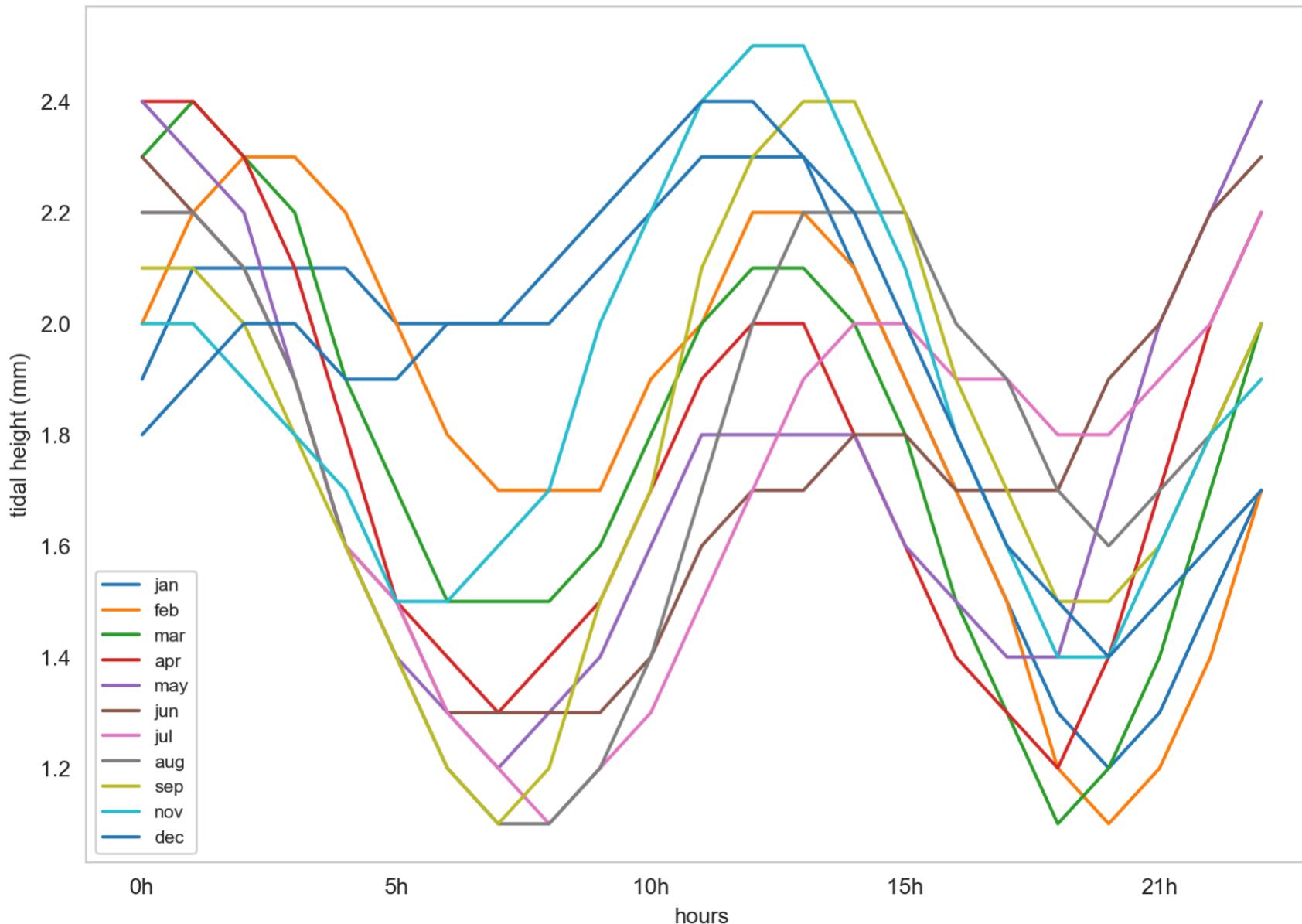


Tidal ebb and flow in 2022

month	year	month_num	0h	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h	17h	18h	20h	21h	22h	23h	
January	2022.0	1.0	1.9	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.0	2.1	2.2	2.3	2.3	2.3	2.1	1.9	1.7	1.5	1.3	1.2	1.3	1.5	1.7	
February	2022.0	2.0	2.0	2.2	2.3	2.3	2.2	2.0	1.8	1.7	1.7	1.7	1.9	2.0	2.2	2.2	2.2	2.1	1.9	1.7	1.5	1.2	1.1	1.2	1.4	1.7
March	2022.0	3.0	2.3	2.4	2.3	2.2	1.9	1.7	1.5	1.5	1.5	1.6	1.8	2.0	2.1	2.1	2.0	2.0	1.8	1.5	1.3	1.1	1.2	1.4	1.7	2.0
April	2022.0	4.0	2.4	2.4	2.3	2.1	1.8	1.5	1.4	1.3	1.4	1.5	1.7	1.9	2.0	2.0	1.8	1.8	1.6	1.4	1.3	1.2	1.4	1.7	2.0	2.2
May	2022.0	5.0	2.4	2.3	2.2	1.9	1.6	1.4	1.3	1.2	1.3	1.4	1.6	1.8	1.8	1.8	1.8	1.6	1.5	1.4	1.4	1.7	2.0	2.2	2.4	
June	2022.0	6.0	2.3	2.2	2.1	1.9	1.6	1.5	1.3	1.3	1.3	1.3	1.4	1.6	1.7	1.7	1.8	1.8	1.7	1.7	1.7	1.9	2.0	2.2	2.3	
July	2022.0	7.0	2.2	2.2	2.1	1.9	1.6	1.5	1.3	1.2	1.1	1.2	1.3	1.5	1.7	1.9	2.0	2.0	1.9	1.9	1.8	1.8	1.9	2.0	2.2	
August	2022.0	8.0	2.2	2.2	2.1	1.9	1.6	1.4	1.2	1.1	1.1	1.2	1.4	1.7	2.0	2.2	2.2	2.2	2.0	1.9	1.7	1.6	1.7	1.8	2.0	
September	2022.0	9.0	2.1	2.1	2.0	1.8	1.6	1.4	1.2	1.1	1.2	1.5	1.7	2.1	2.3	2.4	2.4	2.2	1.9	1.7	1.5	1.5	1.6	1.8	2.0	
November	2022.0	10.5	2.0	2.0	1.9	1.8	1.7	1.5	1.5	1.6	1.7	2.0	2.2	2.4	2.5	2.5	2.3	2.1	1.8	1.6	1.4	1.4	1.6	1.8	1.9	
December	2022.0	12.0	1.8	1.9	2.0	2.0	1.9	1.9	2.0	2.0	2.1	2.2	2.3	2.4	2.4	2.4	2.3	2.2	2.0	1.8	1.6	1.5	1.4	1.5	1.6	1.7



2022 Tidal Height



Findings:

1. The highest tidal height typically is at noon
2. Tidal height changes in the early morning, afternoon and evening
3. Ave of every 6-8hours there will be a tidal change

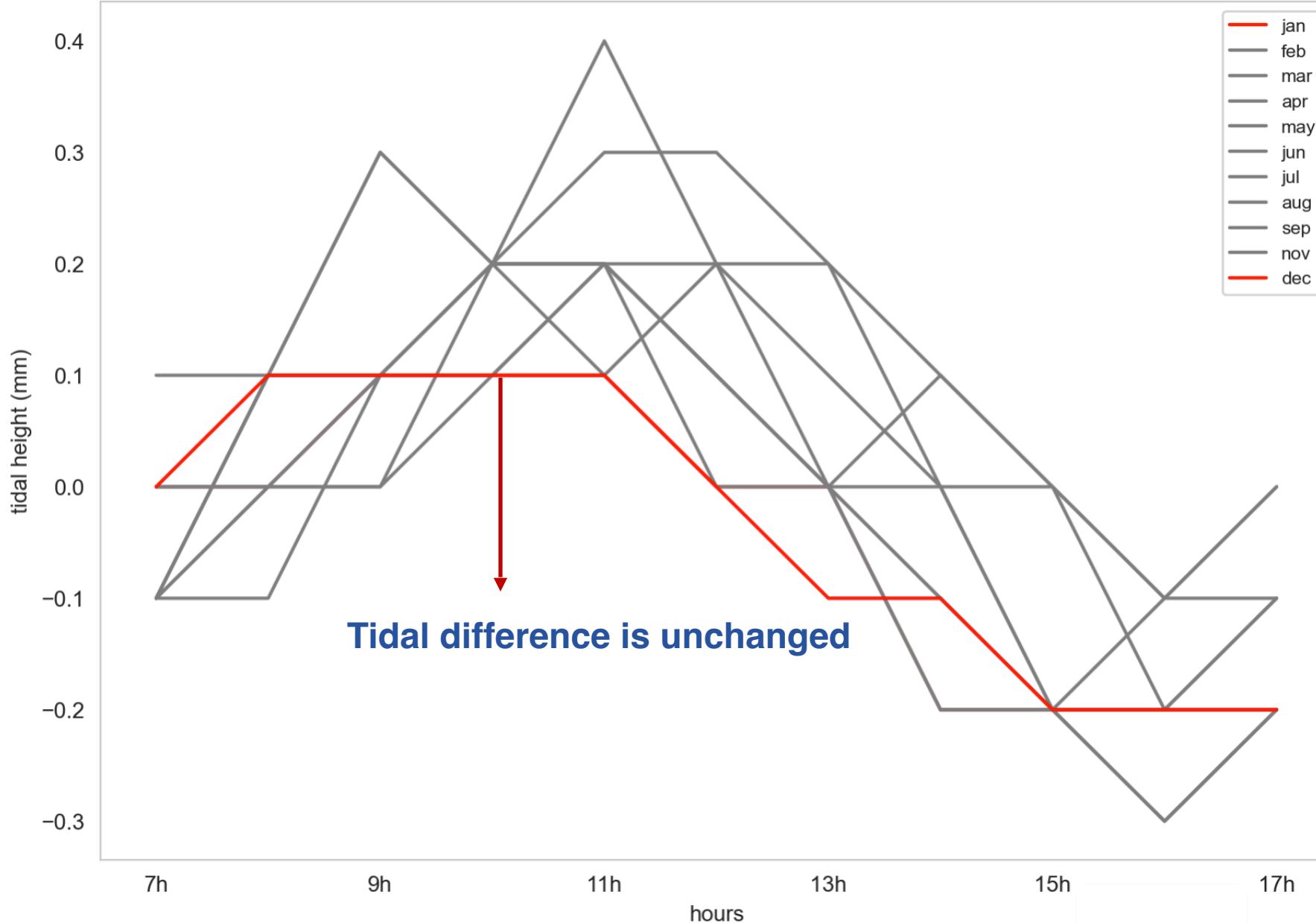
Tidal difference by hour

month	7h	8h	9h	10h	11h	12h	13h	14h	15h	16h	17h
Jan	0.0	0.0	0.1	0.1	0.1	0.0	0.0	-0.2	-0.2	-0.2	-0.2
Feb	-0.1	0.0	0.0	0.2	0.1	0.2	0.0	-0.1	-0.2	-0.2	-0.2
Mar	0.0	0.0	0.1	0.2	0.2	0.1	0.0	-0.1	-0.2	-0.3	-0.2
Apr	-0.1	0.1	0.1	0.2	0.2	0.1	0.0	-0.2	-0.2	-0.2	-0.1
May	-0.1	0.1	0.1	0.2	0.2	0.0	0.0	0.0	-0.2	-0.1	-0.1
Jun	0.0	0.0	0.0	0.1	0.2	0.1	0.0	0.1	0.0	-0.1	0.0
Jul	-0.1	-0.1	0.1	0.1	0.2	0.2	0.2	0.1	0.0	-0.1	0.0
Aug	-0.1	0.0	0.1	0.2	0.3	0.3	0.2	0.0	0.0	-0.2	-0.1
Sep	-0.1	0.1	0.3	0.2	0.4	0.2	0.1	0.0	-0.2	-0.3	-0.2
Nov	0.1	0.1	0.3	0.2	0.2	0.1	0.0	-0.2	-0.2	-0.3	-0.2
Dec	0.0	0.1	0.1	0.1	0.1	0.0	-0.1	-0.1	-0.2	-0.2	-0.2

Findings:

1. **January and June** have the ideal tidal difference because it has the most hours denoted by 0.0 where the tidal difference is unchanged.

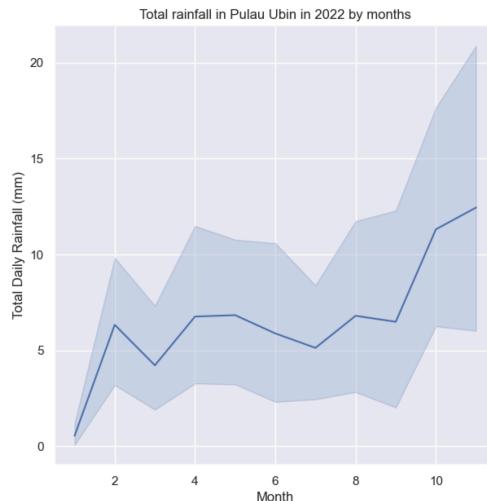
2022 Tidal Height Difference by Hour



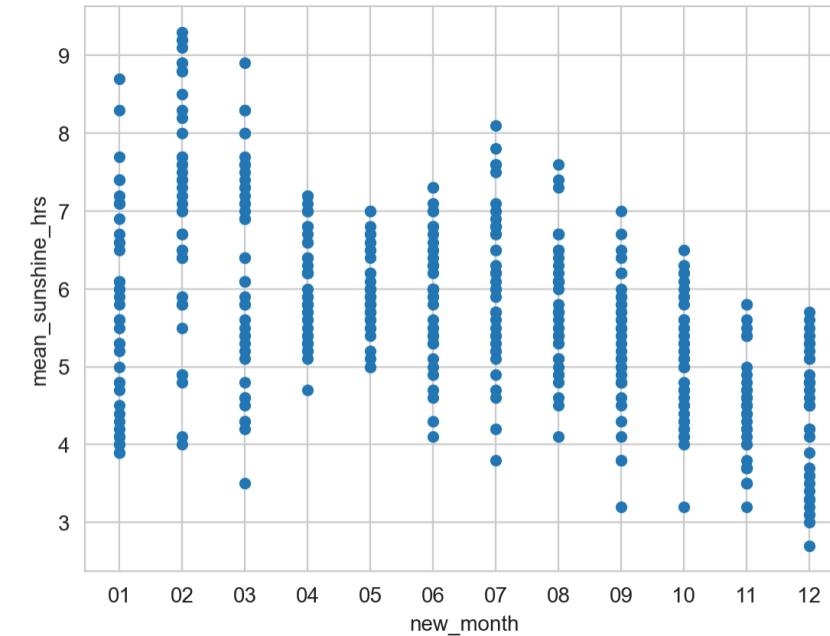
Conclusions & Recommendation

Factoring the tidal data which has a significant impact on the success for the kayaking trial route, our conclusion and recommendation is to conduct the trial in Jan 2022 because of these 4 factors:

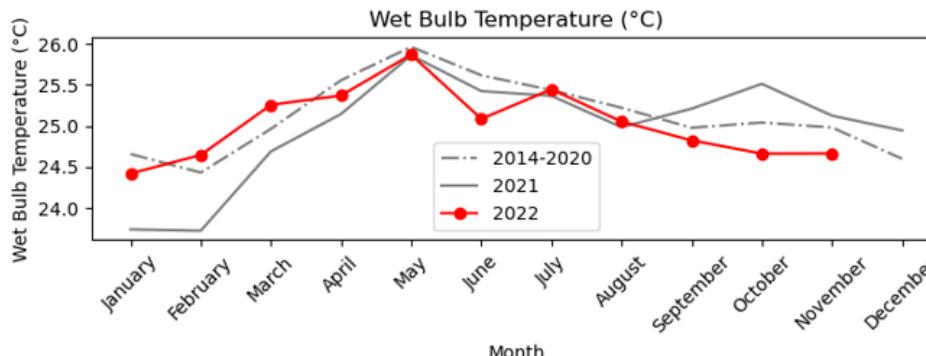
1. Jan has the least rainfall



2. Longer sunshine duration



3. Favourable humidity temp



4. Favourable tidal conditions





The way to get
started is to quit talking
and begin doing.

Walt Disney

Thank you