Algae Bloom Drone Source Water Monitoring

SWM-36

Cyruss Allen Amante, Clara Yaromich, Emile Gennaro, Sydney Durigon

01

Project Scope

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Source Water Monitoring is essential to protect the public from harmful consumption.

- Focusing on the Rainy Lake of the Woods region
- Goal is to create early detection for algal blooms in water sources
- Develop a suitable plan for automated source water monitoring

Project Scope II

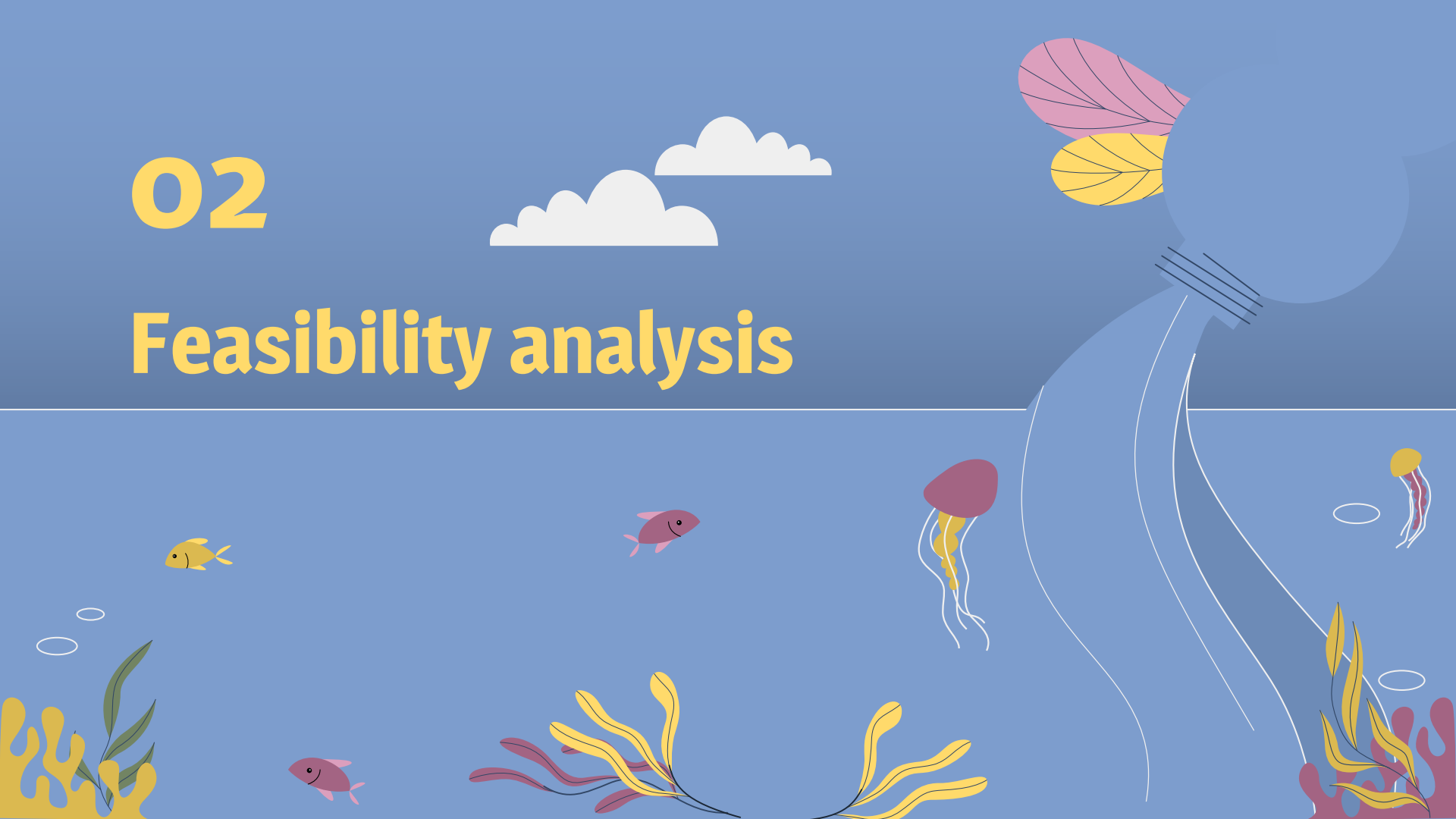
Scope of the project is a guideline containing necessary considerations and features of the system

- PERSEID Layers
- Drone Design
- Flight path
- Image Algorithms

Allow a detailed description of the design to create an easier transition for next steps in design implementation

02

Feasibility analysis



Performance Layer

01

Accuracy

Algae detection algorithm

02

Vibrations

Image quality factors

03

Battery Life

Sufficient travel for data sample

04

Weather

Cloudiness, wind and storms

Environmental Layer

01

Co2 Impacts

Emissions and energy efficiency

02

Noise Impacts

Disturbances to people and wildlife

03

Air Pollution Impacts

Any fuel reliance and air pollution for urban areas

04

Wildlife Impacts

Birds within flying radius and noise concerns

Socio Cultural Impact

Considerations

- Invasion of privacy due to data protection
- Public disturbances
- Openness to new technology
- Dangers due to technology failures
- Hours of operation`

Constraints

- Sound level below 75 decibels
- No power to camera in transport
- No flight over residential areas

Model Adjustments

01

Silent Motor

Brushless motors

02

Adjusted Flight path

Create a bubble around private property that blocks drone traversal

03

Hours of Operation

Daytime during week days

04

Data Security

Hardwire connection to transfer data from drone

Regulatory Layer

Licencing

Pilots need a licence for drones over 250g and under 25kg

Flight Altitude

Must fly below 400ft

Public Avoidance

Keep a horizontal distance of 30m

Emergency Operation Avoidance

Keep away from emergency operations and advertised events

Cyanobacteria Limits

Maximum of 0.0015 mg/L cyanobacteria allowed inside water source.

Model Adjustments

01

Obtain Licence

Remotely controlled by a licensed pilot within line of sight

02

Adjusted Flight path

Altered flight path to avoid the public and objects

03

Adjusted Flight Altitude

Drone flight below 400ft

04

Frequent Checks

Frequent drone checks due to Cyanobacteria limits

03
Decision-Making

Decision Explanation

Water Monitoring System

Brainstorming

Image capture/detection
Battery sources
Machine Learning Algorithms
Decision Matrix

PERSEID Layers

Adjustments based on constraints/considerations

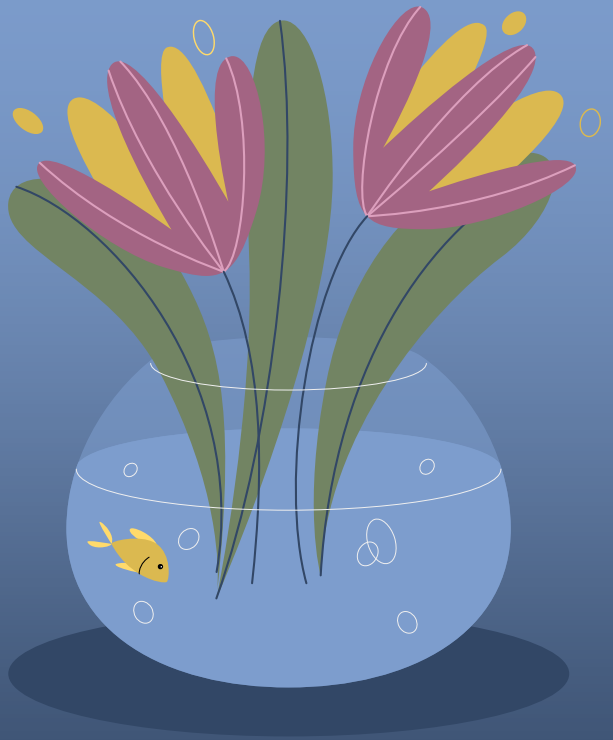
Client Requests

Adjust to specific needs from client

Challenges

Find a different perspective to handle our drones (civilization strategies)

04 Client Requests



Requests

Maintenance

Data Protection

Water Samples

Balancing PERSEID Considerations

Weekly Drone Maintenance

- Maintenance for all drones on Sundays

- Extra surveillance on Saturdays and Mondays

- Modify flightpath distribution

Data Protection Methods

Hardware

Human interference, Secure data storage

Software

Large scale implementation, Encryption, & Backups

Mixed

Extra security, utilizes best aspects of both methods

Regulations for Water Sampling

Person Recognition

Maintain safe distances

Danger

Detection when flying at lower altitudes

Avoidance of Specific Areas

Private properties, urban centers, & emergency operations

Path Planning to Balance PERSEID Layers

Performance

Maintenance, battery life, maximizing efficiency

Socio-Cultural

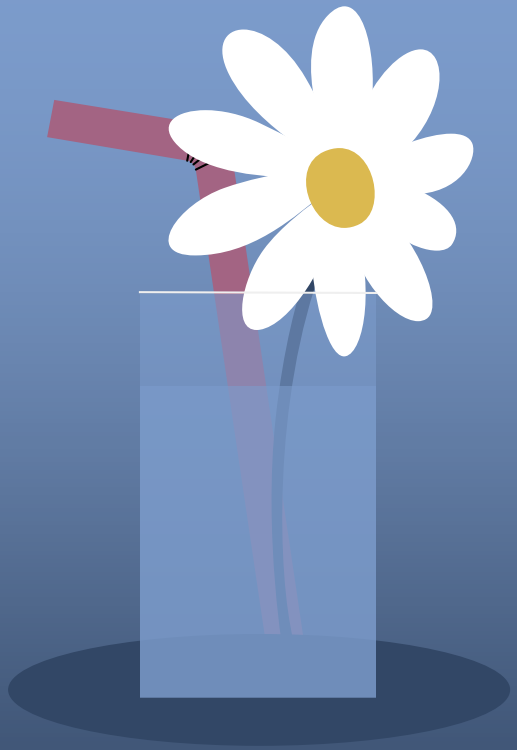
Maintain required distances, utilize announcements and privacy measures

Environmental

Renewable energy sources, sensors to adjust to wildlife & climate conditions

Regulatory

Legal limits and regulations will be followed



Final Design 05

Important Points

Image Recognition

Use convolution neural networks and spectral reflectance imaging

Flight Path Planning

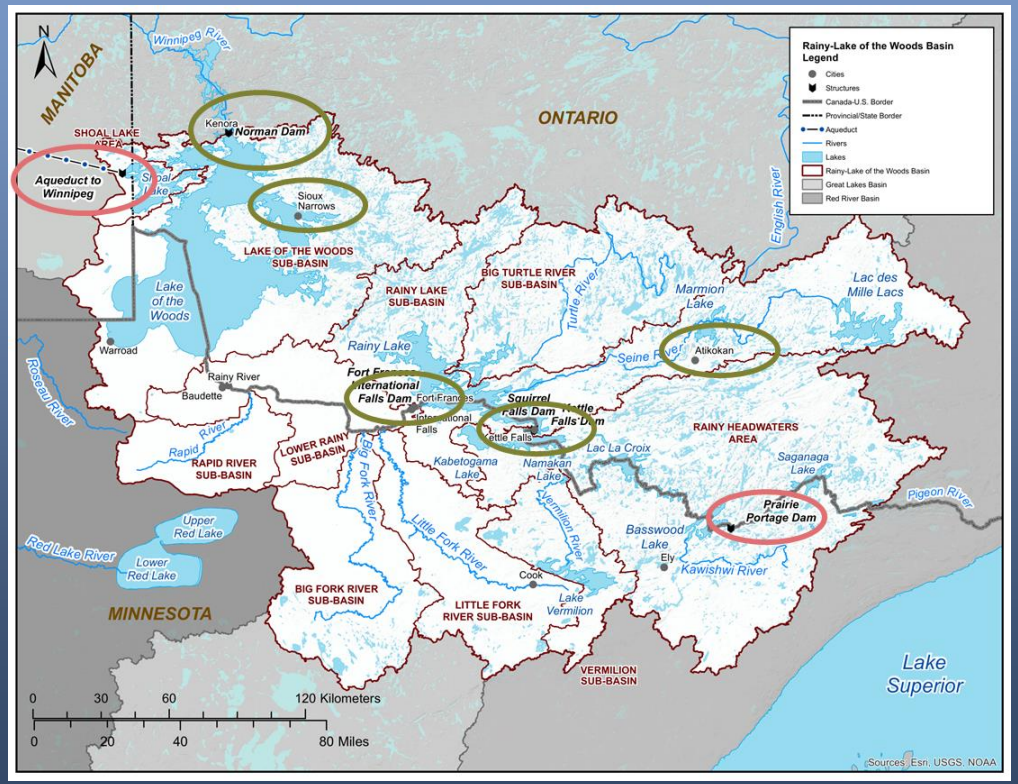
Use A* algorithm to make optimal paths

Limited Range

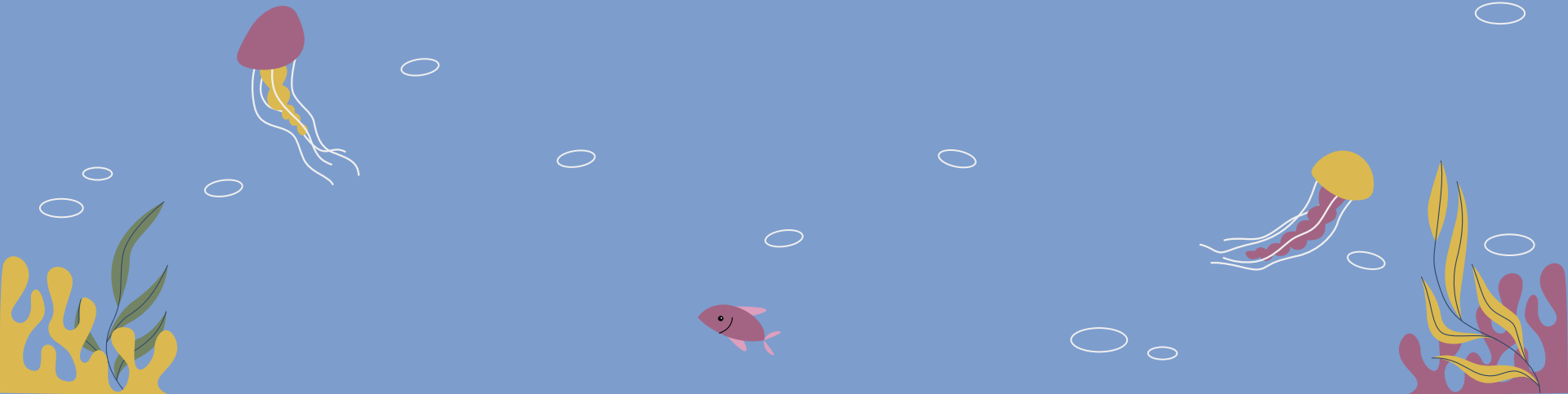
Use satellite imaging for areas not directly in water quality range

Social Nature of the Project

Protect Civilian Drinking Water Quality
International Watershed Board
Use civilian groups for testing on inoperable days and areas



06
Next Steps



Technical

- Find space for charging station
- Implement data protection code, merge with pre-existing data
- Secure pilots' licenses

Social

- Survey on public desire and opinion
- Establish relationships with local businesses and governments

Other Business Opportunities

Mines and other large infrastructure

Use water, algae blooms, possess power infrastructure

National Parks

Need water quality tests, hard to travel

Photography and Surveying

Use when drones aren't needed, winter applications

Thanks!

Do you have any questions?

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