Monitoring Water Quality for Aquaculture using NASA Remote Sensing Observations

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Workshop Agenda

Part 1: Presentations [9:30 to 11:00 AM]

- Introduction to NASA Water Resources Program
- Introduction to Earth Observations for Monitoring Water Quality
  - Fundamentals of Remote Sensing
  - Satellite missions
  - Data products
- **Demonstration**: data access, analysis, and visualization web tools: Worldview
- **Overview of Satellite-based Tool for Rapid Evaluation of Aquatic EnvironMents (STREAM)**
- **Demonstration: data access, analysis, and visualization web tools: STREAM**

Break [11:00 to 11:15 AM]

Part 2: Hands-on Exercises [11:15 AM to 12:15 PM]

- Monitoring coastal and inland WQ parameters for facilitating aquaculture applications using Worldview and STREAM

Summary and Survey [12:15 to 12:30 PM]

NASA Water Resources Program

Leveraging NASA Satellite Data

Sustained water resource management decisions

- Precipitation
- Snow Cover
- Groundwater
- **Water Quality**
- Evapotranspiration
- Soil Moisture
- Surface Water

Fundamentals of Remote Sensing

Satellites:
- Orbits determine temporal resolution

Sensors:
- Measure electromagnetic radiation in selected bands
- Swath, Pixel impact spatial resolution
- Spectral and radiometric resolutions impact accuracy of measurements

Bio-geophysical Data Retrieval
- Sensors measure **spectral signature** determined by how the material reflects, absorbs, or emits radiation at different wavelengths.
- We can infer what a material is by looking at the kinds spectral signature it has at different wavelengths.

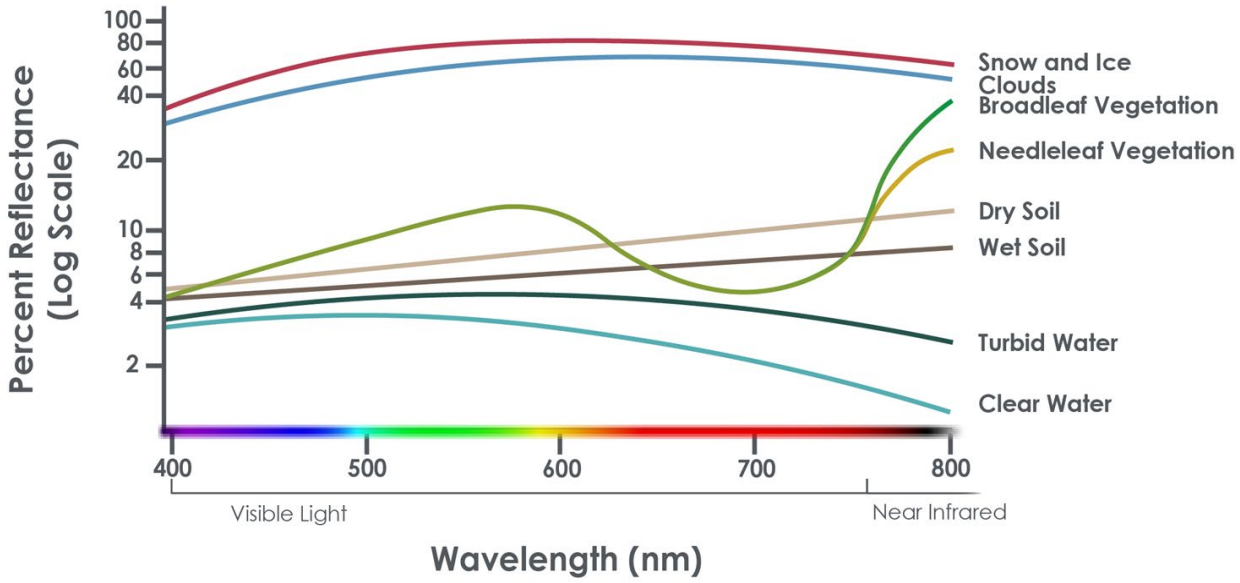
Satellite Data Levels:
- Level 0 & 1: Raw data
- Level 2 : Bio-geophysical quantities
- Level 3 : Gap-filled composites, gridded data
- Level 4 : Combined with models for value-added data
- **Level 3 & 4 data are the easiest to use.**

ARSET – Fundamentals of Remote Sensing

Water Quality Monitoring from Satellites

Parameters	Satellites
Chl-a, TSS, Secchi Disk Depth	Landsat 8 Landsat 9
Chl-a, SST,	Terra Aqua
Chl-a, SST	SNPP JPSS
Chl-a, TSS, Secchi Disk Depth	Sentinel 2A Sentinel 2B & 2C
Chl-a	Sentinel 3A & 3B
Chl-a	PACE
Salinity	SMAP
Bathymetry	ICESat-2
Water Surface Height	Jason-3, Sentinel-6

Derived from Spectral Signature:



Remote Sensing Water Quality Data

Water Quality Monitoring for Aquaculture Applications:

- Reviewed Chlorophyll-a, Total Suspended Sediments, Water Transparency, SST
- Web Tools: Worldview and STREAM

Advantages:

More cost-effective, with **improved spatial and temporal coverage**

- Provides information where there are no ground-based measurements
  - Much wider scope and context than feasible with in-situ
- Data are **freely available** with web tools and trainings

What Next for Aquaculture?

- Remotely sensed Chl-a, SST, TSS, and others can be correlated to in-situ fish mortality data to gauge threshold values/range of these parameters appropriate for sustainable aquaculture activities.
- It is possible to predict in advance the time of satellites overpass in a particular area of interest.
- Watershed/ecosystem processes (precipitation, runoff, streamflow, landcover data are available from remote sensing to support water quality data and decision making.
- Historical and current water quality and watershed data can support aquaculture site selection or relocation by monitoring water quality, nutrient, and discharge data.
- ARSET can provide more advanced, in-person trainings focusing on specific regions.

Your Feedback is Important

Please use the QR Code to complete the workshop feedback survey:

Contact Information

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- ARSET YouTube

For questions, comments, or to share how you have applied our trainings to your work or studies, email nasa.arset@gmail.com.

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Thank You!