Surface-First™ Water Intelligence: Monitoring Methods Comparison

Comparison of monitoring approaches for hydrocarbons, harmful algal blooms and dissolved organics across surface and open waters
Each monitoring method has unique strengths for different monitoring objectives and applications

Criteria	Surface-First™ Water Intelligence	Submerged Sensors	Grab Sampling + Lab Analysis	Satellite Remote Sensing	Airborne Sensing (Hyperspectral)
Sensor Contact with Water	No	Yes	Yes	No	No
Primary Monitoring Layer	Surface — before mixing, dilution and dispersion	Water column — after reaching sensor depth	Surface and water column	Surface (large-scale)	Surface (resolution dependent)
Real-Time Monitoring	Continuous, real-time	Continuous (between maintenance)	No	No	Near-real-time when in use
Typical Parameters	• Hydrocarbons (thin surface films / slicks) • HABs / Algae (multi-pigment) • CDOM / fDOM	• Hydrocarbons* (below-surface / dissolved) • HABs / Algae (multi-pigment) • CDOM / fDOM, other	• Hydrocarbons (at and below-surface) • HABs / Algae (full ID) • CDOM (full ID)	• Hydrocarbons (med-to-large slicks) • HABs (large blooms, mono/dual-pigment**) • CDOM (absorption)	• Hydrocarbons (small-to-large slicks) • HABs / Algae (multi-pigment) • CDOM (absorption)
Spatial Coverage (Scale)	Flexible — spot, local area or wide area	Single point / localized	Point / localized	Global / regional	Regional / targeted area
Depth Profiling	Surface layer only (typ. <1 m in clear water)	Yes	Yes	No	No
Deployment Flexibility	High — non-contact; fixed, pan-tilt, buoy, boat or drone	Submerged mounting	Site visits and personnel required	Externally scheduled (fixed revisit cycles)	Aircraft or UAV platform required
Relative Cost	Medium ($$$)	Medium ($$$) (TCO driven by maintenance)	Medium-High ($$$$) (high labor / analysis)	Low ($)	High ($$$$$)
Maintenance Requirements	Minimal (occasional lens wiping)	Routine (cleaning, calibration, consumables)	Labor-intensive (site visits and laboratory analysis)	None	Aircraft scheduling and support

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* Submerged sensors are optimized for water-column measurements rather than surface films, sheens or surface-first contamination. ** Most satellites lack 620 nm band for phycocyanin.