

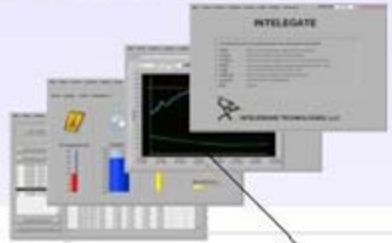
A Smart Wireless Sensor Network for Monitoring Hawaiian Mountain-to-Sea Environments

Mike Kido

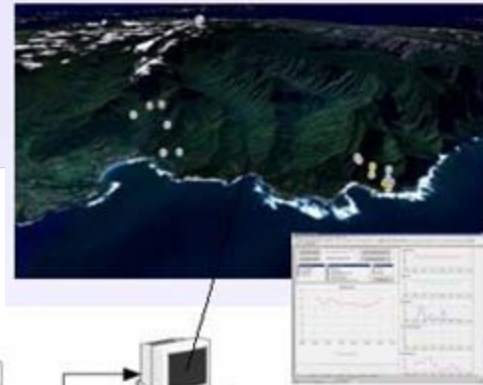
The Center for Conservation Research
And Training

University of Hawaii at Manoa

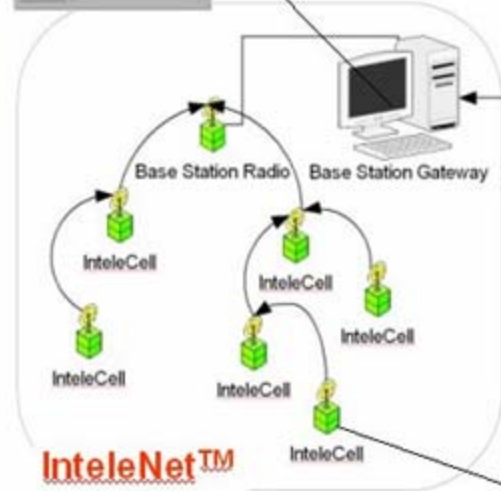
IntelGate™: Gateway and Control Software



IntelView™: 3D GIS display of sites and sensor data



INTELESENSE TECHNOLOGIES



IntelNet™

IntelCell™: Handheld and field-deployable, GPS-enabled, wireless datalogger



Weather Station



Water Quality Sensor



Animal Vector Tracking



Air Quality Sensor



Video Monitoring



Q Name or Lat, Lon?



P a



5000 m

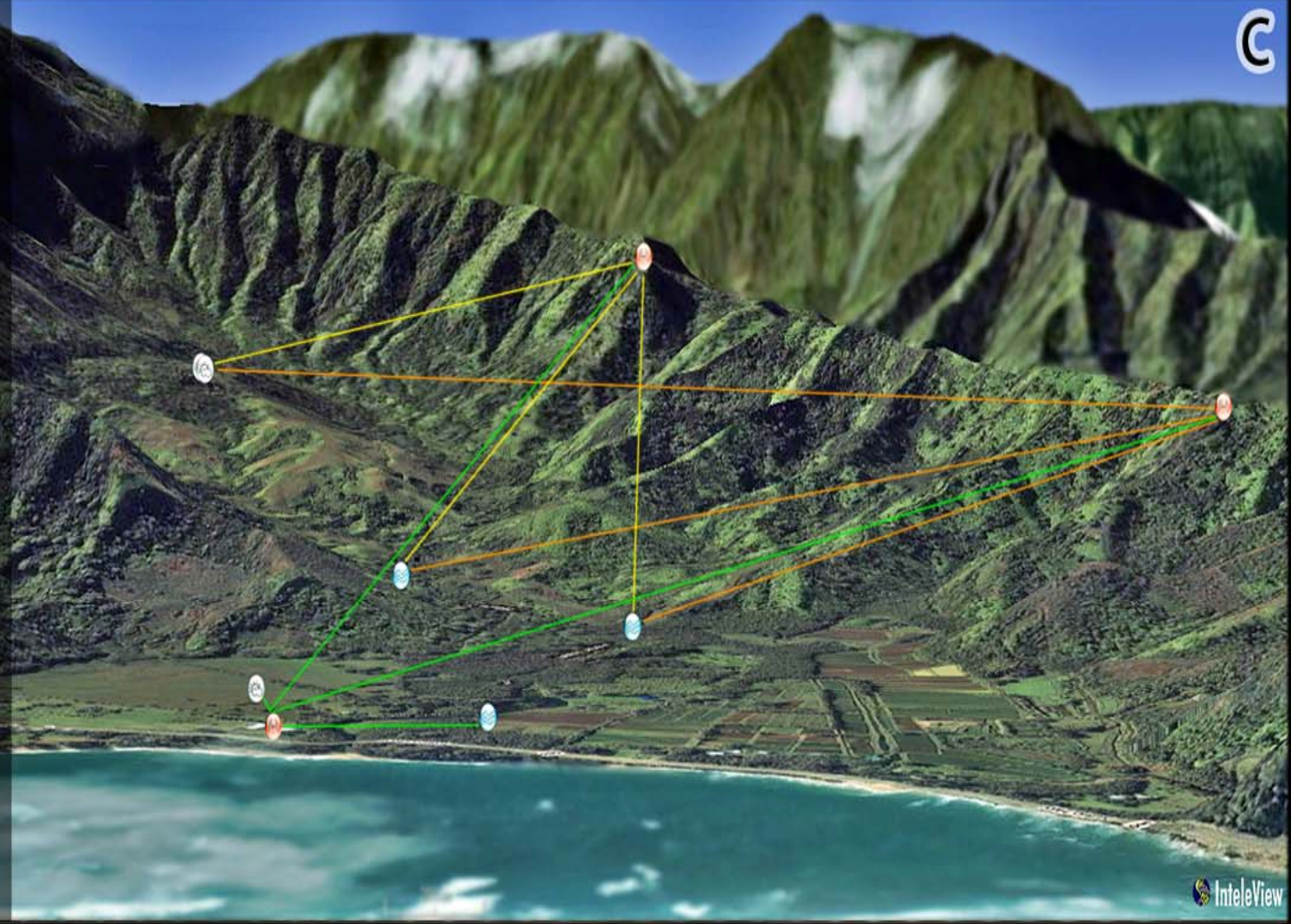
IntelView



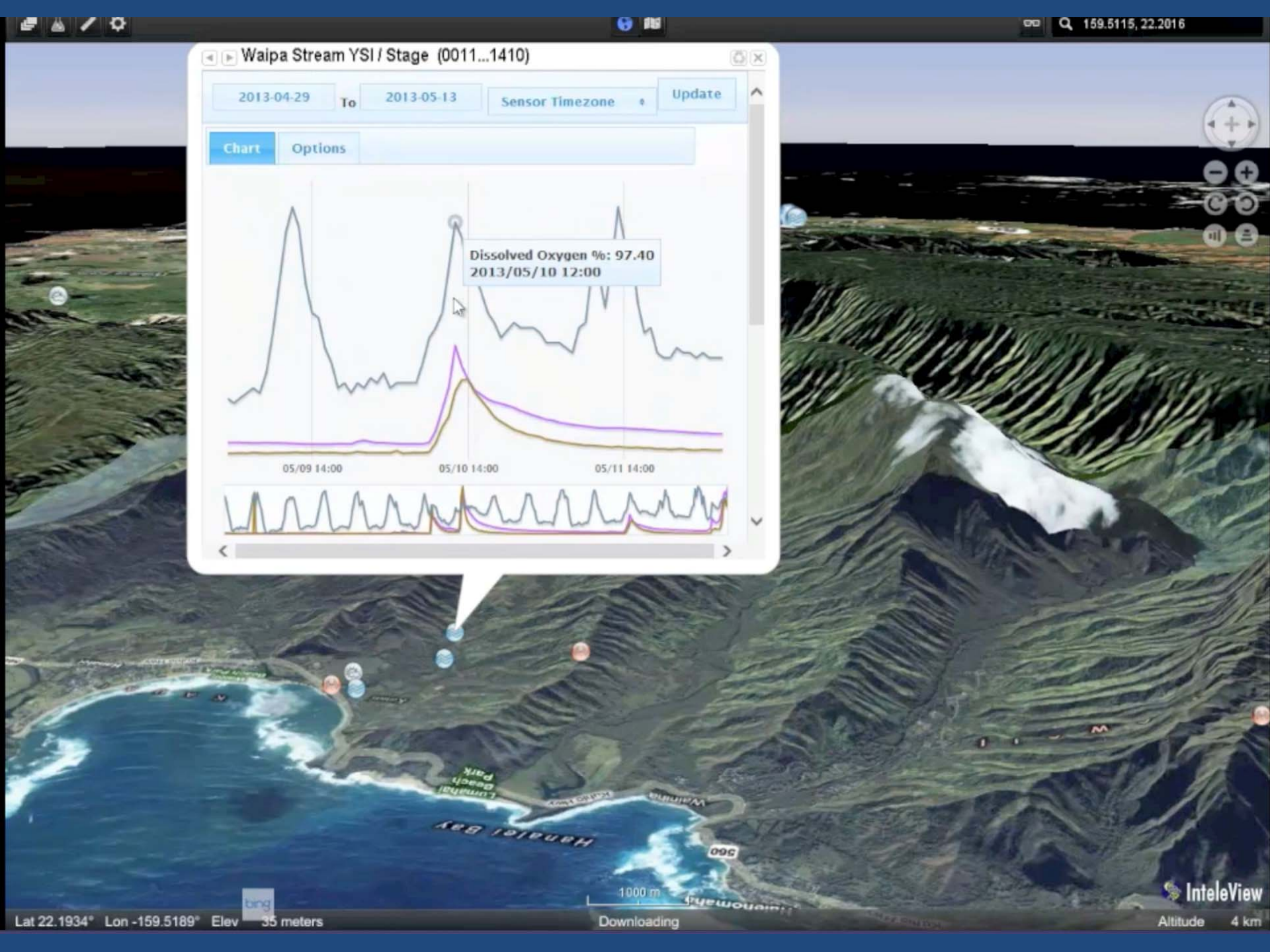
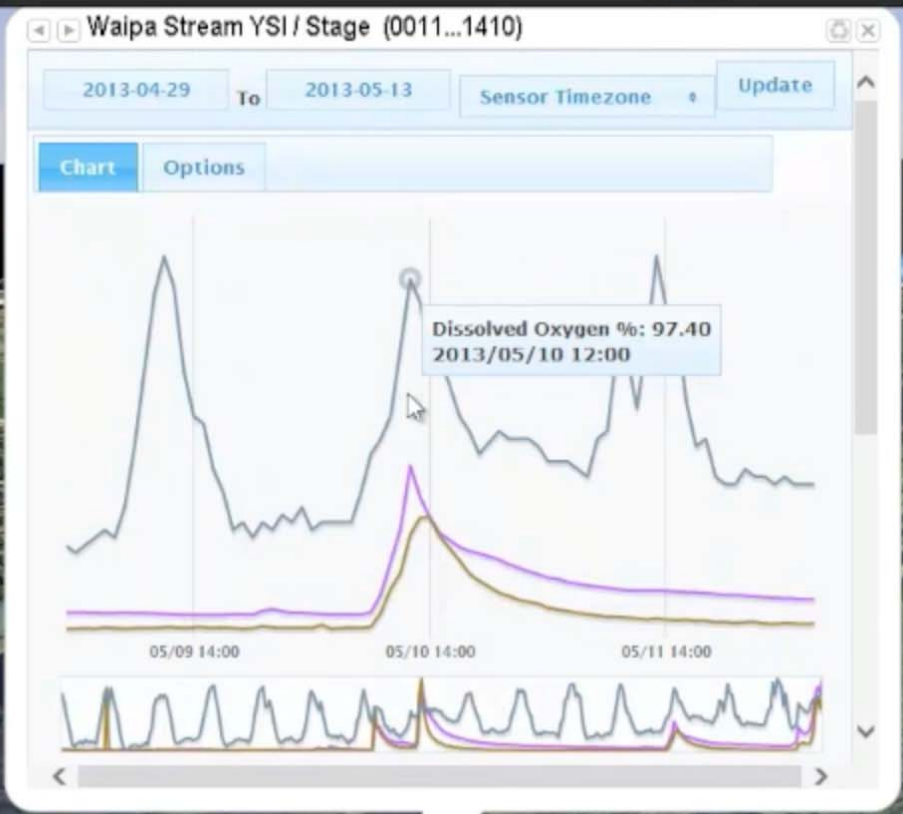
a



b



c



Generate Monitoring Station Report

1 Select Monitoring Stations

Click and drag to select stations

- OR -

Select testing stations from the list

- Intelesense - Waipa Lower - ING (11-20021) Retired - 0000001100020021
- Intelesense - Waipa Lower CSI Weather (Discont.) - 0000000400000002
- Intelesense - Waipa Mauka Weather (0011...0012) - 0000001100000012
- Intelesense - Waipa Ridge Repeater 1 (0011...4FD1) - 0000001100004F01

Clear Selection

2 Select Report Dates

Start Date
8/1/2013

End Date
10/29/2013

3 Select Aggregation Period

Weekly (7 Days)

4 Generate Report

Ok



Layers

Land Use

- Agricultural Land Use
- Agricultural Lands of Importance
- % Low Intensity Development (per watershed)
- % High Intensity Development (per watershed)
- Major Roads /acre (per watershed)
- Population Density 2000/ sq mile (per watershed)
- Zoning 2010

Land Cover

- Hydrology
- Sewer
- Climate
- Elevation Products

Legend

- Agricultural Land Use
- Animal Husbandry
 - Aquaculture
 - Field Crops
 - Orchards
 - Pineapple
 - Sugarcane
 - Wetlands

Graph	Constituents	00000
<input type="checkbox"/>	Rain Fall	✓
<input type="checkbox"/>	Soil Moisture	✓
<input type="checkbox"/>	Air Temperature	✓
<input type="checkbox"/>	Relative Humidity	✓
<input type="checkbox"/>	Solar Radiation	✓
<input type="checkbox"/>	Wind Speed	✓
<input type="checkbox"/>	Wind Direction	✓
<input type="checkbox"/>	Wind Gust Speed	✓
<input type="checkbox"/>	Rainfall Intensity	✓
<input type="checkbox"/>	Rainfall Duration	✓

Download Table >

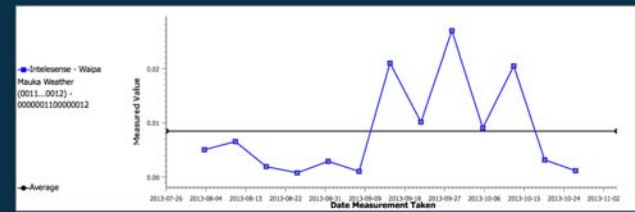
Rain Fall

Matching Stations: 0000001100000012 - Intelesense - Waipa Mauka Weather (0011...0012) - 0000001100000012

Method: INTELESENSE

Summary	Data Count	Minimum	Average	Variance	Standard Deviation	Standard Error	Maximum	Total
Intelesense - Waipa Mauka Weather (0011...0012) - 0000001100000012	13	0.001 in	0.008 in	0.000 in	0.009 in	0.002 in	0.027 in	0.110 in

Download Table >



InteleCell Next Generation (with compatible hardware)

LCD Display / Keypad Menu



10W-20W
Solar Panels

Cellular Base Station /
Antenna



MiFi Mobile
Hotspot



HOBO Weather Station /
and compatible sensors

Vaisala Weather Station



InteleCam Image Sensor

900 MHz Long-Range RF Module (Xtend)
900 MHz Short-Range RF Module (XBee)

Omni-Directional and
Directional Yagi Antennas



Built in Wi-Fi / Ethernet / GPS

YSI 6920 Multi-
Parameter Sondes



Stage Height
Sensors

'Smarter' Smart Mesh Wireless Network



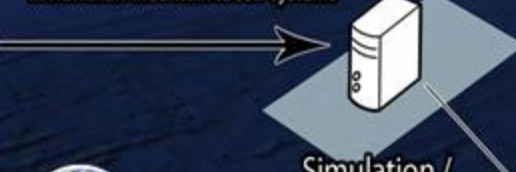
CyberGIS - Spatial Decision Support (SDS)



STEM/Community Outreach



AWS cloud enabled modeling of climate change impacts on water resource states in Hawaiian 'mountain to sea' systems



Simulation / Modeling



Intelesense Technologies

Geospatial knowledge discovery by analyzing the spatial characteristics of environmental data



Research Groups

Amazon Web Services Cloud

Internal Applications

Dell Sonic Firewall

Application Server

SDE Database

ArcGIS 10.1 Server

Data Repository

Backup Server

Secure Gateway Cluster

Virtual Machines

Internal Network

Public / Community Access

External Applications

Secured user access into collaboration and information content management environments



The Research Cyberinfrastructure Core (RCC)

Developed at the University of Hawai'i at Mānoa with NSF EPSCoR investment for researchers to transform 'data into knowledge'. Integrates environmental monitoring with secured data acquisition and management, fusion and integration, analyses and visualization.