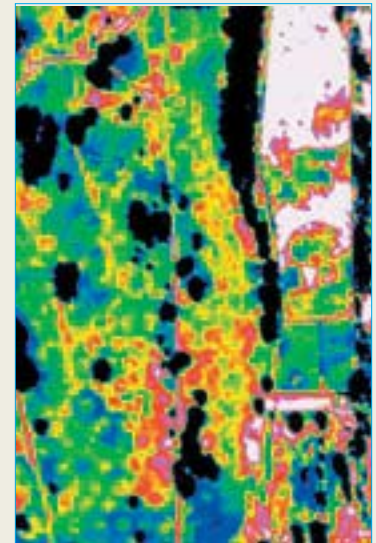
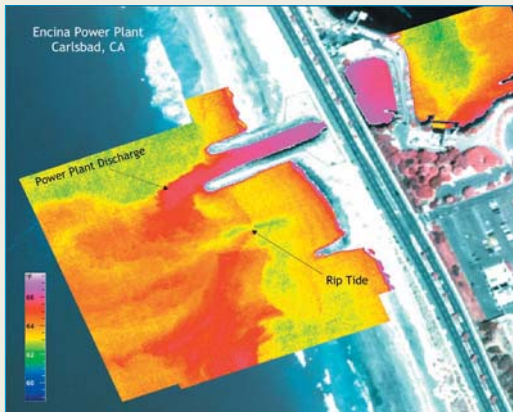


A View ABOVE ALL

News From *Ocean Imaging Corporation*

OI ACQUIRES THERMAL IMAGING SYSTEM

Ocean Imaging has purchased a state-of-the-art thermal imaging camera system from Germany's Jenoptik AG. Using custom-developed software, the camera is integrated with high-accuracy geolocation hardware and a near-real-time image dissemination system that allows instant transfer of captured imagery to ground stations for processing and analysis. Although the system was primarily purchased for advanced oil spill mapping research, OI intends to utilize it in a broad range of research and operational activities. The sensor has 0.06°C thermal resolution and is fully calibrated. Spatial resolution is determined by aircraft flight altitude, allowing detection of even sub-meter size targets. It is highly portable and can be mounted and operated simultaneously with our DMSC sensor, yielding both thermal and multi-spectral UV-Vis-nearIR image data.



A thermal image reveals details of warm water discharge from a coastal power plant (left) and temperature patterns on a golf course show vegetation transpiration trends (above).

HOW MUCH IS A FISH WORTH?

Try \$4.1 million! On 10/31/2006 Mr. Steve Lassley – captain of the “Bad Company” fishing team and a long-time user of our SeaView fishfinding service won the Annual Bisbee’s Black & Blue Marlin Tournament in Cabo San Lucas, Mexico. The total payout set a new record in sportfishing tournament history. Mr. Lassley’s team of top-notch sport anglers won the competition despite it’s being cut from 3 days to 2 because of a nearby meandering hurricane. In such conditions, having the very latest and most accurate oceanographic information, as SeaView provides, is vital. “I wouldn’t leave the dock without SeaView, period!” says Mr. Lassley. He plans to utilize OI’s services to expand his “dream team” winnings in other tournament locations, including Hawaii and the East Coast. Steve and his “Bad Company” are now also official spokespersons for OI’s sportfishing services.



Long time SeaView users, and winners of the largest sport fishing tournament purse ever recorded.

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Imaging A LEVIATHAN



Sulfur-coated rocks in Leviathan Creek near the mine.

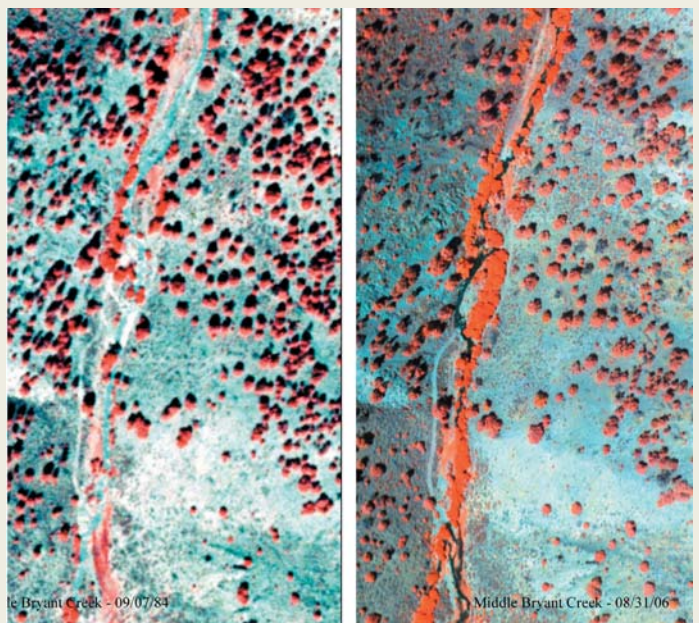
The OI team got to image a leviathan recently, except this one was on land. "Leviathan Mine" is an abandoned open pit sulfur mine on the eastern slope of the Sierra Nevada mountains. It's been inactive since 1962 but continued to severely contaminate the creek system downstream, so much so that in 2000 the EPA listed the mine as a Superfund Site. The high sulfur content of the waste rocks turns snowmelt, rain and groundwater into sulfuric acid, which leaches contaminants such as arsenic, nickel, zinc and others from the ground. Needless to say, this toxic soup regularly killed everything in its path – both plant and animal. In the past few years a number of remediation projects were enacted, primarily to hold back and treat the acidic drainage before the water is released into the stream.

In 2006 Ocean Imaging was contracted by the Washoe Tribe of Nevada and California who, along with the California Dept. of Fish & Game, wanted to assess how much the vegetation along the creek has changed (i.e. hopefully improved) since the remediation efforts started. This information is also needed for legal settlement negotiations.

The plan was to obtain historical imagery from the 1980s which could be used to identify and spatially classify riparian vegetation along the stream. The results could then be compared with present-day classifications derived from newly acquired imagery. The choices for historical images at the needed spatial resolution were quite slim, but a USGS-collected color infrared image set from 1984 offered 50cm resolution and sufficient contrast between riparian and other plant species to be useful for the project. The new imagery was acquired by OI on 8/30/2006 with our DMSC aerial sensor. The image collection was done simultaneously with field sampling, which was later used partly to train the classification algorithms and partly to assess classification accuracy of the final product.

The field work was, of course, the most fun since it involved camping along the creek, hiking through beautiful country, and fishing in the Carson River into which Leviathan Creek ultimately empties. One of our field personnel even stumbled onto a bear!

The results of the study were also quite interesting. As expected, there has been a marked increase in riparian (primarily willow, hazelnut and grass) species in and along the mine-affected creek channels, especially in areas that had large sand bars too poisonous for vegetation to grow on in 1984. What was unexpected, however, was the finding that riparian vegetation cover along several nearby "control" creeks not affected by the mine had also increased a bit. In the case of the reference creeks, though, the riparian species did not colonize the few bare ground areas. Instead, willows and hazelnut bushes crowded out other species. Since the riparian plants need more moisture than conifers, sagebrush and similar plants, it is intriguing to speculate whether the record snowfalls (and hence snowmelt) in 2000-2005 caused a general change in species composition in parts of the Sierras.



Portion of the mine-affected creek as it looked in 1984 (above left) and in 2006 (above right and below). Note the great increase in riparian vegetation (bright red) along the creek bed.



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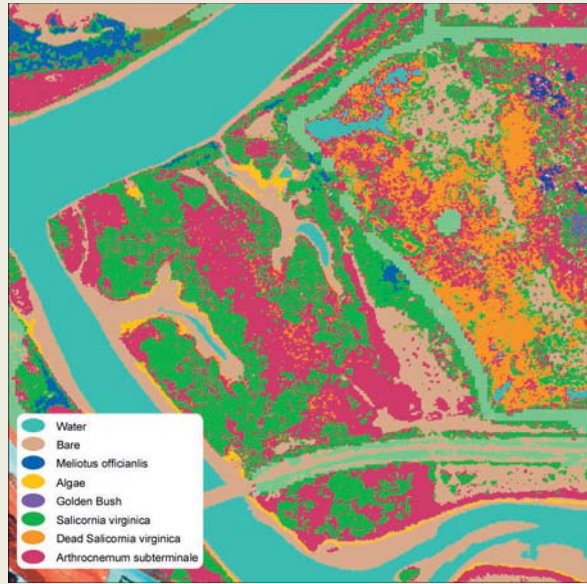
ARE THEY PUTTING UP A CONDO PROJECT?

That's the most common question passing people were asking us on a recent field sampling trip at the San Dieguito Lagoon near San Diego. For several years now OI has had a contract to image the



lagoon with our DMSC aerial sensor and classify the vegetation ground cover for native and invasive species. Our data were then used to delineate areas of the lagoon that contain native habitat. The rest is the subject of an \$80+ million restoration

effort financed by Southern California Edison. Late last year giant bulldozers showed up one day and in an alarmingly short amount of time denuded most of the area of any vegetation. Then came the digging, not for condo foundations but for a large water reservoir that will help keep the lagoon open to the ocean through a tidal channel. Through our periodic aerial imaging, OI is helping the California Coastal Commission keep a bird's eye view on progress of the project. It's been a long time since the lagoon enjoyed a pristine environment. It served as a municipal airport from the 30s through 50s, with a brief stint as a Navy facility during WW2, then housed a factory complex. The remnants of these facilities have now been all removed as part of the restoration. Estimated completion, including replanting all areas with native species is slated for early 2010.



Part of San Dieguito Lagoon classified for native and invasive species (above). The lagoon before restoration began (below left), and 6 months later (below right).



CONTEST: WHERE IN THE WORLD ARE WE?



This tropical nation, origin of the word "Atoll", consists of over 1000 coral islands and is surrounded by rich fishing grounds. OI recently began providing SeaView fishfinding services to members of its fleet. Unfortunately, the country's highest point is only 2.4 meters above sea level. Rising sea levels linked to global warming may cover much of its land before the end of the century. The first 5 readers who correctly identify this location will receive a free Ocean Imaging T-shirt!

E-mail answers to michaela@oceani.com (don't forget to state shirt size: M, L or XL).

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Oil Research CONTINUES

Upon receiving Phase 2 funding from the US Minerals Management Service (MMS), OI is continuing development work on its novel oil spill thickness mapping system. Initial work proved that utilizing multispectral imagery for classification of oil thickness distributions within an oil slick is possible. The second phase of the project aims to refine the algorithms, add an infrared sensor, and automate the mapping capabilities to enable near-real-time map dissemination capability. The work is again being done in collaboration with the California Dept. of Fish and Game.

One of the main obstacles in evaluating the developed algorithms in a "real world" setting is finding opportunities to image oil on the ocean surface. Since none of us want to have our funding revoked and/or go to jail, dumping any amount of petroleum into the ocean is out of the question. On the other hand, waiting for an oil spill to happen is not a viable research strategy. One alternative is to find naturally occurring oil seeps – which we are lucky to have nearby in California's Santa Barbara Channel. We have utilized the Santa Barbara seeps in previous work and will do so again.



The DMSC in a crow's nest above the tank (above), high pressure cleaning of our oil test enclosures (near right) and oil targets classified for thickness (far right).

Another opportunity to gather data for refining and validating our algorithms is MMS's Ohmsett facility in New Jersey. A giant saltwater-filled tank, specially designed for oil research and testing, provides a means to release known amounts of different oil types into floating containment squares and hence know exactly the existing oil thicknesses. A wavemaker can even add waves of a chosen height. Experiments we did at Ohmsett last year proved very useful for the algorithm development and we plan to make another visit to the facility during the continuing project. Our instruments can be mounted above the tank or actually flown over it in a helicopter or aircraft. Last year we mounted the DMSC on the skids of a MASH-type "whirly-bird" chopper and imaged the tank.

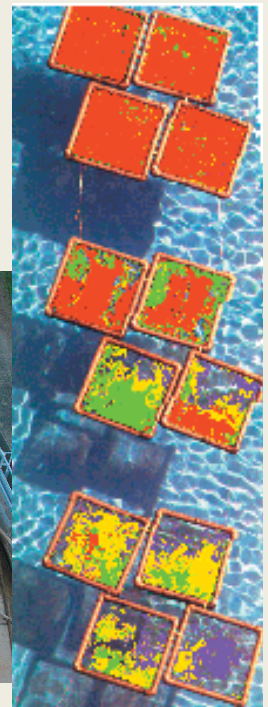
One of the goals at Ohmsett will be to study the thermal change of various oil layers through the day-night cycle. Our past results



Our DMSC sensor mounted on the chopper skids taking off to image oil in the Ohmsett tank.

show that multispectral imagery in the UV-to-visible range can be used to measure oil film thickness up to about 0.3 mm. That may not sound like much, but it's actually quite thick for an oil spill slick. Thermal imaging can potentially expand that range up to 1mm or more. However, heating of the oil by the sun during the day and its cooling at night must be accounted for in the measurement. To help us, we plan to run experiments where the thermal imager will be mounted over the Ohmsett tank during the day and into the night, periodically imaging an "oil spill" below at a preset time interval.

Our most recent results will be presented by OI's president, Dr. Jan Svejksky at the 20th International Oil Spill Conference in Atlanta, Georgia, 4-8 May, 2008.



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