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**Linus Cotsapas****Research Planning, Inc.**

Vice President, Senior Project Manager

Mr. Cotsapas is a marine biologist with a multidisciplinary background and considerable international experience in managing, organizing, and executing environmental and coastal resources projects. Mr. Cotsapas has been instrumental in developing and heading the company's international projects. Having executed projects in more than thirty countries in South, Central, and North America, the Middle East, Africa, Europe, and Asia, Mr. Cotsapas has extensive experience in a wide range of environments.

Mr. Cotsapas has managed the preparation of environmental assessments and environmental impact studies in numerous countries, and he has developed and managed nearshore and coastal monitoring programs. In conducting these studies, and in addition to their overall management, Mr. Cotsapas has been involved in: project design; fieldwork execution; government, private client, NGO, and stakeholder interactions; government and international institution regulations; and report preparation. He has been involved in sensitivity and resource mapping, natural resources damage assessment, and has been a member of RPI's spill response team since 1985.

Mr. Cotsapas is a senior officer of Research Planning, Inc. and has been the Vice President since 1990. He is also the Managing Director of Pandion Saudia Company, an affiliated company of RPI that is established in Saudi Arabia. He has published over 80 technical publications, consultant reports, studies, and documents, including company and project business plans, and training manuals, as well as regional and national development plans.

**EDUCATION**

B.S., Marine Biology, McGill University, Montreal, Canada (1981).

**PROFESSIONAL EXPERIENCE**

1985 to Present: Research Planning, Inc., Columbia, SC, USA.

- Vice President since 1990
- Marine Ecologist and Coastal Resources Expert

1983-1984: Technical Assistant, Texas A&M University, Galveston Texas.

1982-1983: Technical Assistant - Formulation of Greece's National Five Year Plan for Fisheries and Aquaculture (Ministry of Coordination; plan for 1983 - 1988), Athens, Greece.

1981-1982: Research Assistant in invertebrate biology projects and research dive master. Worked in numerous aquaculture related and marine research facilities and experimental stations in the United States, Canada, and the Caribbean.

Mr. Cotsapas' experience is outlined separately in the following pages in five main areas in which notable projects are highlighted:

- 1) Environmental Remediation and Restoration
- 2) Environmental Assessments, Impact Studies and Ecological Risk Assessments
- 3) Coastal Resource/ESI Mapping
- 4) Oil and Hazardous Material Spill Response/Damage Assessment
- 5) Development Plans; Policy

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## **ENVIRONMENTAL REMEDIATION AND RESTORATION**

Artificial Reefs Site Selection Study, Arabian Gulf, Saudi Arabia (2012-2013). Project Manager. Mr. Cotsapas lead a team of experts on a comprehensive field survey of over 80 sites in the Arabian Gulf waters of Saudi Arabia to evaluate their suitability of deployment of artificial reefs. Project goals included: 1) Selection of locations where artificial reefs may be most likely to support self-sustaining reef-based communities; and 2) Identification of appropriate and practical artificial reef design parameters most like natural reefs in the area, and recommendations for optimum design criteria such that the program goals may be achieved.

Coastal and Marine Restoration and Remediation Program (as the Program Management Support Contractor) to restore coastal and marine habitats damaged by the 1991 Gulf War oil spill (2009-2013). Project Manager, Coastal Program. Saudi Arabia was awarded US\$470 million to remediate restore coastal and marine habitats from the United Nations Compensation Commission (UNCC). The project is being conducted under contract to the Presidency of Meteorology and Environment (PME) of Saudi Arabia. Project works include over 163,000 m of channel excavation in target marshes, over 3,000,000 m<sup>2</sup> of marsh and sand/mud flat surfaces to be tilled to break up surface barriers and release trapped hydrocarbons. Through these works, an area of approximately 1,800 ha of salt marshes and flats will be remediated, which will positively affect an even greater range of connected landscapes.

Watershed Restoration - Identification and Mitigation of Non Point Source Fecal Coliform Pollution and Reduction of TMDL of Sediments in South Carolina Water Sheds, United States (2000-2006). Project Manager for several projects, funded through the U.S. Environmental Protection Agency (EPA) and the South Carolina Department of Health and Environmental Control to identify Non Point Source (NPS) fecal coliform pollution and to design and implement best management practices with a goal to a reduce fecal coliform contamination and sediment run-off in the individual streams in several watersheds.

Environmental Assessment, Injury Determination, and Emergency Restoration Plan for Coral Reefs, Pago Pago, Tutuila, American Samoa (1999). Conducted field work to map coral reef and other marine habitats in the vicinity of 9 grounded tuna longline fishing vessels in Pago Pago Harbor. Data collected were part of an Emergency Restoration Plan to determine injuries to the marine habitat, and assess potential injuries as a result of salvage activities to remove the grounded vessels.

## **ENVIRONMENTAL ASSESSMENTS; AND ECOLOGICAL RISK ASSESSMENTS**

Mr. Cotsapas has been involved in Environmental Assessments, Impact Studies and Ecological Risk Assessments for almost 30 years. Notable examples of projects conducted include:

Hydrodynamic Modeling and Habitat Assessment of East Corniche Island, Abu Dhabi (2009). Project Manager. Conducted ecological assessment, mapping, and quantitative spatial analysis as part of a team to investigate the pollution problems and evaluate the implications of planned coastal modifications. The project, conducted for the Environment Agency-Abu Dhabi (EAD), coupled hydrodynamic modeling and water quality studies with high-resolution, ecologically based habitat mapping via advanced remote sensing techniques to analyze potential impacts from a planned development. Dredging concerns, water quality deterioration, and habitat loss were key components of the assessment.

Assessment of Coastal Pollution in the Greater Jeddah Region, Saudi Arabia (2007-2008). Project Manager. Mr. Cotsapas led a multidisciplinary team of experts to assess the water and sediment quality for the nearshore and coastline of Jeddah and make specific recommendations for more than US\$350 million in remediation projects. Project involved seawater and sediment sampling; stable

isotope analyses (to determine long-term historical pollution events); hydrographic surveys (currents, waves, and bathymetry; and interviews with the main industries and wastewater treatment plants in Jeddah. Long-term deployment of Acoustic Doppler Current Profilers (ADCPs) was also conducted to collect current, wave, and water level data. Data collected from the field efforts and the long-term deployment of the ADCPs was used in numerical modeling to generate 3D model of hydrodynamics and determine dispersion from the numerous identified outfalls.

Palmetto Bluff Marina Assessment Study, New River, South Carolina, USA (2004-2006). Project Manager. Mr. Cotsapas lead the field studies to collect water quality and physical data including deployment of tide gauges, conducting ADCP surveys, conductivity, temperature, and depth casts (equipped with additional sensors to measure turbidity), dissolved oxygen measurements, and erosion studies (using both ongoing measurements and historical photo interpretation). The results of the field studies were used to generate numerical models to determine the most suitable site for a marina. Long-term monitoring stations to assess the rate of erosion adjacent to the selected marine site were also established and monitored.

Shoreline Survey of Eastern Coast of Saudi Arabia to Determine Extent and Degree of Oiling resulting from the 1991 Gulf War Oil Spill, Saudi Arabia (2002-2003). Deputy Project Manager & Senior Ecologist, Project was to survey the coastline using dGPS to determine the extent of oiling, and assess impacts to the ecological habitats as a result of the Gulf War. The project included survey of +750 km of shoreline, collection of +26,000 sediment and bivalve samples for chemical analyses, use of QuickBird satellite imagery to classify habitats and map oil distribution (surface and buried oil).

Offshore Environmental Baseline Survey, West Africa Gas Pipeline (WAGP), Ghana, Togo, Benin, Nigeria, (2002-2003). Chief Scientist. The WAGP project consists of a gas pipeline spanning approximately 617 km (580 km of which are offshore) from Nigeria to Ghana, for delivery of gas to Benin, Togo, and Ghana. Mr. Cotsapas coordinated all scientific activities for the 18 scientists from six countries on board the 143-ft research vessel to collect physical, chemical, and biological data, which was used as part of the EIS for the WAGP Project.

Environmental Impact Assessment for “Sistema de Interconexion Electrica de los Paises de America Central (SIEPAC)”, Costa Rica (2003). Project manager of RPI’s role which included overlaying the existing route with satellite imagery and other available geographic information system (GIS) data layers to identify areas of environmental and social concern for the 500 km segment of the corridor that passes thru Costa Rica.

Monitoring Studies for the Keta Sea Defense Works Project, Ghana (2000-2005). Project Manager and Senior Scientist. The monitoring studies were designed to assess the impacts of both the construction activities and post-construction impacts to the nearshore and lagoon environments and included: physical/chemical- notably water quality and water circulation; biological- including fish and crustacean population dynamics and recolonization, turbidity effects on *Ruppia* beds, bird population monitoring, bird habitat-island (part of the mitigation plan) colonization, etc.; and socio-economic- mainly to subsistence and commercial fishing. The project also involved close coordination among local scientists, the Ghana EPA, and the ExIm Bank of the United States.

Field Surveys to Assess Impact of Thermal Discharge from a Power Plant to Fish and Wildlife in the Beaufort River, Parris Island, South Carolina, USA (1999). Project Manager. Field studies on water hydrology (temperature, salinity, dissolved oxygen, pH, and free chlorine) to determine extent of thermal plume from the discharge of a power plant on Parris Island. Fish and oysters were also sampled to assess their health and determine potential impacts of the plume on these organisms. Study was part of an EIS to provide data for permit issuance/variance based on thermal impact.

EIS for the Keta Sea Defense Project, Keta, Ghana (1996-1997). Project Manager. The project consisted of impact assessments of the proposed engineering works including: construction of groynes and sand renourishment to limit further erosion on a 7 km section of shoreline; land reclamation of 500+ acres for urban and agricultural development; providing flood relief to communities around the lagoon; and road construction to re-establish a travel corridor lost to erosion. Project activities included field inventories, analysis of the potential impacts, development of alternatives to minimize environmental impacts from the project, as well as proposing appropriate mitigation alternatives. Remotely sensed SPOT imagery was used to classify wetland types. As project manager, Mr. Cotsapas was also responsible for interacting with the Ghana Environmental Agency (EPA) on the EIS.

Environmental Impact Statement (EIS), Campo Verde Lourdes Residential Development, El Salvador (1996). Project Manager. This EIS was for a housing development project with 2,933 units near the town of La Libertad in El Salvador's coastal zone. Existing land use/land cover, species distribution and abundance, hydrological considerations, and soil erosion characteristics were some of the primary issues studied.

Environmental Baseline of the Niger Delta, Nigerian National Petroleum Corporation, Nigeria (1995). Work involved collection and analysis of thousands of water, sediment, and biological samples from riverine, estuarine, and marine habitats, social assessments, an operations audit, a regulatory framework, draft criteria and standards, and design of a long-term monitoring program. Mr. Cotsapas worked on the analysis of the biological (including fisheries) data collected, and contributed in the writing of the report. This study was a comprehensive and multi-disciplinary field study to establish criteria and standards for oil pollution and control.

## **COASTAL RESOURCE/ESI MAPPING**

Coastal Resources/Environmental Sensitivity Index (ESI) Mapping. Coastal resources and ESI mapping products developed by RPI have been used for coastal zone management, hazardous material/natural disaster responses, and contingency planning. Production of ESI's includes a combination of fieldwork and natural resource and human-use data compilation in a robust relational database to assemble these data into a useable format for planners, responders, and resource managers to use.

Mr. Cotsapas has served as project manager on the following coastal resources/Environmental Sensitivity Index (ESI) projects (produced in both English and Spanish):

Panama Canal, Panama	2005
Puerto Quetzal area, Pacific Coast, Guatemala	2002
Caribbean Coast, Guatemala	2002
Golfo de Fonseca (El Salvador, Honduras, Nicaragua)	2001
Honduras Caribbean Coast (including Bay Islands)	2001
El Salvador	1998

Abu Dhabi Coastal Environmental Atlas (2009-2010). Mr. Cotsapas was RPI's Project Manager for the Development of a Coastal Resources Atlas and Environmental Vulnerability Index to support coastal management and planning as well as oil spill response for the coastal and marine environments of Abu Dhabi. The web-based coastal atlas developed compiled and integrated environmental and socioeconomic data into a hierarchical Coastal and Marine Resources and Ecosystem Classification System (CMRECS) previously developed for the emirate. This data base-driven tool is based upon an automated information system with geoprocessing specifications that supports interoperable solutions to make spatial information and services accessible and useful for multiple applications.

## **OIL AND HAZARDOUS MATERIALS SPILL RESPONSE/DAMAGE ASSESSMENT**

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Emergency Response: Mr. Cotsapas has been a member of RPI's spill response team and part of the Scientific Support Team to the U.S. Coast Guard provided by the National Oceanic and Atmospheric Administration (NOAA) for oil and chemical spills since 1985. He has written and edited numerous resources at risk analyses for oil and chemical spills. Mr. Cotsapas has also provided on-scene support for the Emergency Response and Assessment and Restoration Division of NOAA at several incidences, including:

2007: *M/V Cosco Busan*, San Francisco.

2006: Citgo, Calcasieu Lake, Louisiana: Project Manager for the NRDA sediment and biological sampling effort.

1992: St. Eustatius pipeline spill, Puerto Rico.

Mr. Cotsapas has also provided on-scene support for several international spills and NRDA's including:

2008: Assessment of the shoreline impacted within and to the north of King Fahd Industrial Port (Jubail, Saudi Arabia), and recommendations of Natural Resource Damage Assessment (NRDA) protocols to be considered.

1999: Oil Spill Response and initial Natural Resource Damage Assessment (NRDA), *M/V Irish Sea*, Strait of Magellan, Chile. Provided on-site expertise to the Chilean Navy and the spiller, resulting from the grounding of the vessel *M/V Irish Sea* in the vicinity of Isla Bedwell in the Strait of Magellan. In addition to a report on resources at risk, and recommendations on clean-up strategies, also provided recommendations for NRDA work.

1994: Technical Assistance to Beach Clean Up and Evaluation of Beach Clean-up Activities Using Flushing/Tilling Machinery on Beaches in Fujairah, U.A.E. Evaluated the effectiveness of a beach flushing/tilling system used to clean up beaches in Fujairah that were impacted as a result of the collision of the tankers *Seki* and *Baynuna* (which spilled an estimated 5 million gallons of light crude oil).

Inlet Protection Strategies: Mr. Cotsapas has also participated in the execution of Tidal Inlet Protection Strategies (TIPS) projects, in which specific recommendations are made for implementing workable defenses to protect the vital resources of the area's coastal ponds and bays, islands, marshes, and tidal flats during spill incidences. Development of these strategies is founded on a solid scientific and clear technical understanding of the development and dynamics of coastal inlets including but not limited to nearshore coastal geomorphology, tidal currents, sediment transport, erosional and depositional trends, the physical dynamics of associated estuaries and coastal wetlands.

Training: Mr. Cotsapas has been a lecturer and instructor for ESI Mapping, Shoreline Cleanup Assessment, Natural Resource Damage assessment and oils spill response training since 1995 in the United States, El Salvador, Honduras, Bahrain, and Qatar.

Long-term Monitoring: Mr. Cotsapas has been involved in numerous monitoring studies to assess long-term impacts from oil spills. Notable examples include:

2009-2013: Coastal Restoration and Remediation Program to restore habitats damaged by the 1991 Gulf War oil spill. As part of this project a robust monitoring program to assess recovery at coastal sites being remediated was established at 30 sites. Approximately 50 variables are collected at up to 36 individual plots at each site to assess recovery. To better assess the status of ecological recovery, data collected is analyzed using multi-metric indices (MMI) to standardize variables and help assess the rate of recovery.

2007: Lead field efforts to determine extent of sub-surface lingering oil from the *Exxon Valdez* oil spill in Alaska. The project included a three-month field effort using three vessels and 16 scientists and

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technicians who surveyed randomly selected sites in Prince William Sound and the Gulf of Alaska. Following a rigorous sampling plan almost 150 sites were surveyed and the degree of subsurface lingering oil was determined. The results from these surveys were used to validate a model to determine areas within Prince William Sound where subsurface lingering oil may still persist.

2002-2003: Shoreline Survey of Eastern Coast of Saudi Arabia to Determine Extent and Degree of Oiling resulting from the 1991 Gulf War Oil Spill, Saudi Arabia. Deputy Project Manager & Senior Ecologist, Project was to survey the coastline using dGPS to determine the extent of oiling, and assess impacts to the ecological habitats as a result of the Gulf War. The project included survey of +750 km of shoreline, collection of +26,000 sediment and bivalve samples for chemical analyses, use of QuickBird satellite imagery to classify habitats and map oil distribution (surface and buried oil).

## **DEVELOPMENT PLANS; POLICY**

Mr. Cotsapas has been involved in the preparation of development plans and projects and feasibility studies for nearly 30 years. Project examples include:

Assessment of Environmental Considerations and Procedures for the Issuance, Renewal, or Transfer of Shrimp Mariculture Concessions, Ecuador (1993-1994). Project Manager for this project, funded by and conducted for the Inter-American Development (IDB) Bank. The project included a comprehensive review of Ecuador's shrimp mariculture industry, recommendations on establishing standards and criteria for water quality and mangrove protection, definition and delineation of "critical areas", as well design of an environmental evaluation system for the shrimp farms within the existing legal framework.

Survey of Water Distribution Pipeline Projects, El Salvador (1994-1996). Overall Project Manager. RPI's El Salvador office conducted several surveys (using dGPS) projects to determine routes for potable water lines to rural communities. These projects were funded by the European Union following the end of El Salvador's Civil War.

Land and Parcel Survey Projects, El Salvador (1992-1997). Overall Project Manager. As part of the Peace Accords following the civil war in El Salvador, RPI's El Salvador office conducted extensive land survey work on more than 2,000 hectares for Banco de Tierras to map and determine the extent of properties that were available as part of the land transfer initiative to ex-military and ex-guerrilla forces. This survey work was primarily conducted using high definition and positional accuracy dGPS (differential Global Positioning Satellite system). As a follow-up to this, RPI also conducted survey work to divide properties into individual parcels that were assigned to qualified individuals. This work, undertaken for ILP - PROSEGUIR, was conducted using Total Stations Survey Equipment and dGPS. This process included the survey work, parcelization of the property, registration of the plats with the CNR (Centro Nacional de Registro), monumenting of the individual plats, and legal descriptions of the properties.

Strategic Fisheries and Aquaculture Development Plan, Guadeloupe (1990). Project Manager. Preparation of Strategic Fisheries and Aquaculture Development Plan for Guadeloupe (in French and English) for Institut Régional de Pêche et de Marine (IRPM) of Guadeloupe. The development plan was designed to achieve the following primary goals: (1) Identify and develop underutilized fisheries stocks without impacting traditional fisheries. (2) Develop and implement a system for stock assessment. (3) Develop and implement an improved fishery management system. (4) Develop an expanded aquaculture industry. (5) Maintain, conserve, and protect coastal inshore and nearshore environments.

Development of a Shrimp Culture Industry in El Salvador (1989-1992). Manager and Coordinator of all in-country operations. Management and technical support to FUSADES (Fundación Salvadoreña para el Desarrollo Económico y Social) in the development of a marine shrimp farming industry in the

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country. This USAID-funded project involved the design, construction, and operation of shrimp farms, a shrimp hatchery, technical management of shrimp farms, studies of postlarval and gravid female shrimp availability, introduction of better management practices, and ongoing training and technology transfer.

Feasibility Studies of marine shrimp farming by the cooperative sector, El Salvador (1989-1990).

Formulated and negotiated this project to conduct a study to determine the feasibility of marine shrimp farming by the cooperative sector (created through the agrarian reform act) in El Salvador (a USAID project through Arizona State University). Coordinated and managed the project including fieldwork, site evaluation, economic projections, and report preparation (in Spanish and English).

Shrimp Aquaculture Projects (1983-present). Worked on the numerous aspects of shrimp culture projects including: site selection, feasibility studies, impact assessments, project design, operations, and training, in several dozen shrimp farming projects in Mexico, Guatemala, El Salvador, Costa Rica, Panama, Colombia, Venezuela, Ecuador, Indonesia, and Greece as well as other locations in the Caribbean, Europe, and Asia.