

Integrating Coral Reef Ecosystem Integrity and
Restoration Options with Watershed-based activities and
MPA's in the Tropical Pacific Islands

Dr. Robert H. Richmond, Dr. Michael Hamnett,

Dr. Mark Tupper, Dr. Eric Wolanski

Institutions: Kewalo Marine Lab, Univ. of Hawaii; Marine
Laboratory, Univ. of Guam; Social Sciences Research Inst.,
Univ. of Hawaii,, Australian Inst. of Marine Sciences

1. To characterize watershed discharges affecting coastal reefs chemically, temporally and spatially. ✓
2. To determine the classes and concentrations of pollutants of greatest concern to coral reef sustainability and provide quantitative data for revising regional water quality standards. ✓
- 3. To develop protocols that can identify sublethal stress in corals, before outright mortality occurs, and make these available to management agencies throughout the Pacific Islands.**
4. To determine if coral reef recovery and restoration activities are practical following both anthropogenic and natural disturbances, and the sequence of watershed management practices that must precede or parallel reef restoration attempts.
- 5. To determine the efficacy of MPA's, in concert with watershed management practices, in conserving spawning stock biomass and supplying commercially and ecologically important species to impacted reefs.**
- 6. To quantify the cultural and economic impacts of land-based developments that affect coastal resources, and incorporate this information into the decision making process.**
- 7. To develop educational materials for a variety of users and stakeholders, from traditional Chiefs to school children, and to provide opportunities for capacity-building among island resource managers and institutions.**
8. To develop a set of recommendations to prevent damage to coral reef ecosystems, and when such occurs, mitigation measures than may be undertaken.





Study Site 1 – Fouha Bay, Guam





Study Site 2 - Ngerikill Bay – Republic of Palau



Pohnpei, FSM



Yap, Federated States of Micronesia



Grounding Incident



Intermediate Fuel Oil



Cultural Resources



Mangrove Roots



Subtidal Infauna



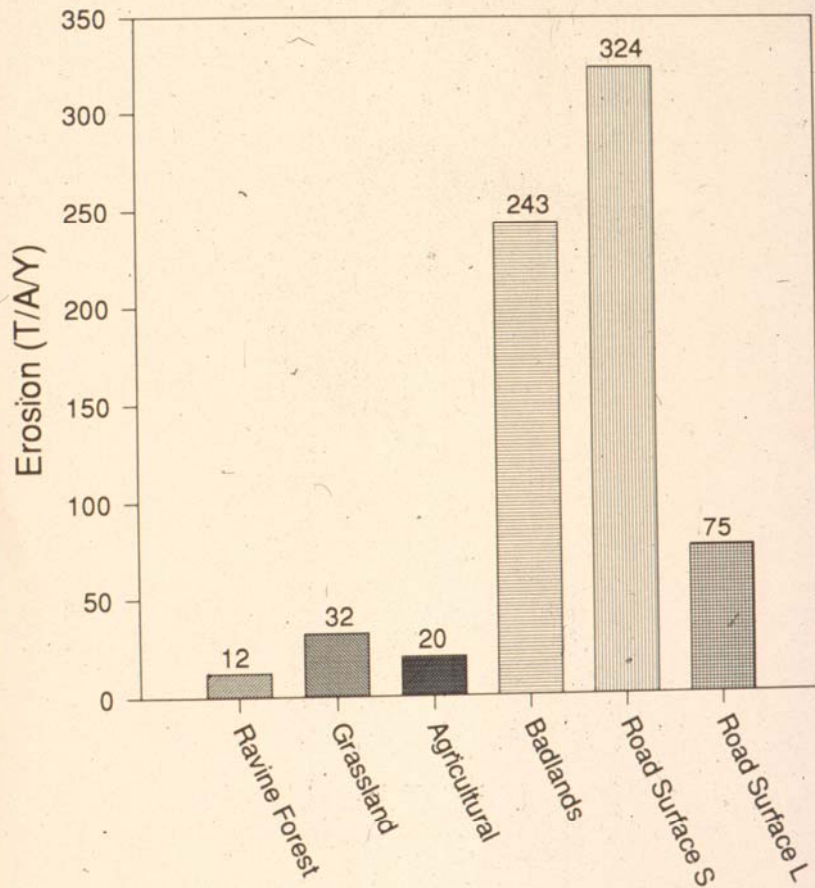
Societal Value – Legacy Issue



Road Runoff



Rate of Erosion for Ugum Watershed



Resource Assessment Ugum Watershed, Guam
U.S. Dept. Agriculture
Natural Resources Conservation Society
Pacific Basin
May 1995

**Representative
Erosional Rates for
High Islands in the
Pacific**

Coastal reef flats and grassbeds lost due to burial



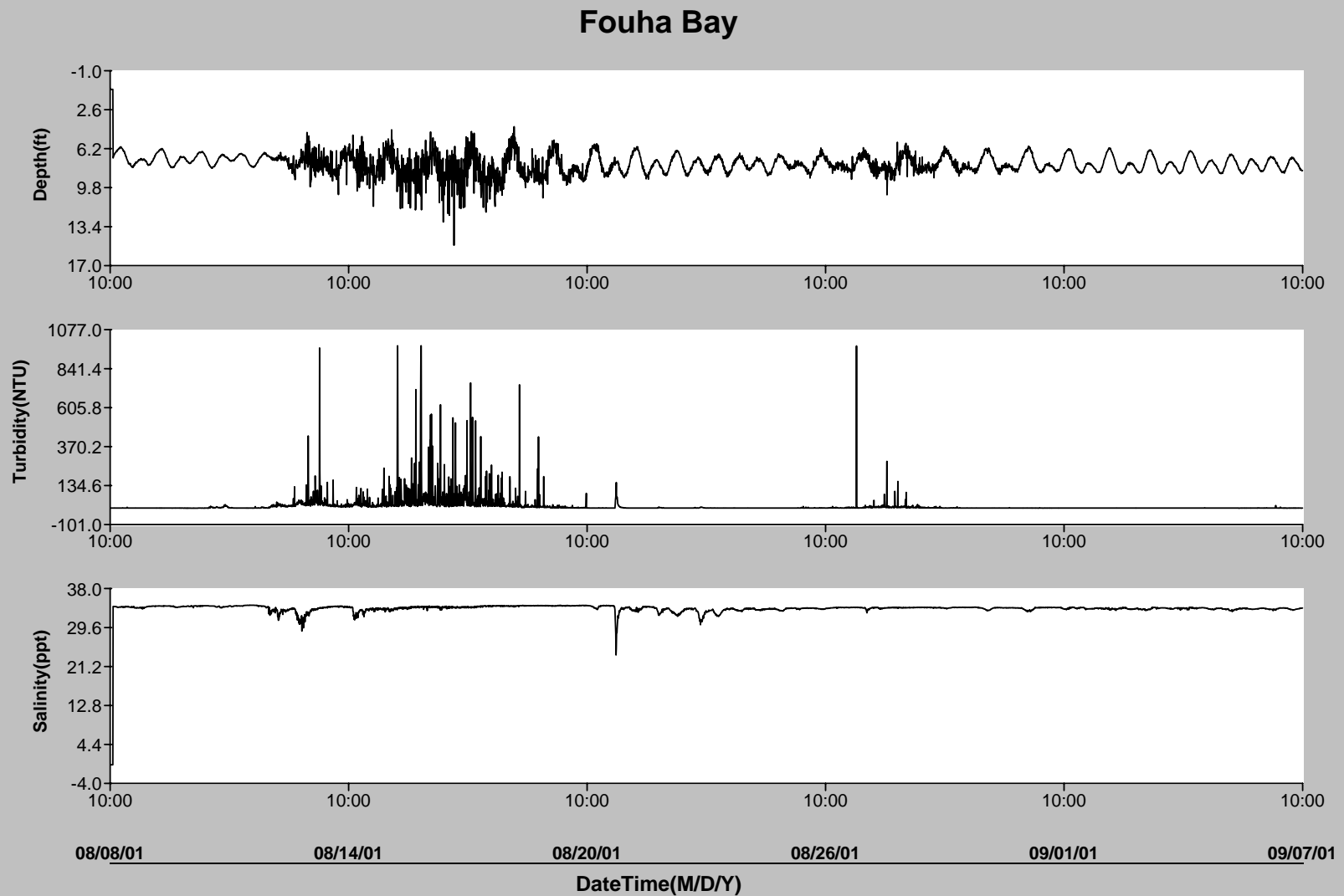
Reduced Coastal Quality: Water and Substratum







Turbidity/salinity/wave profile – Fouha Bay, Guam

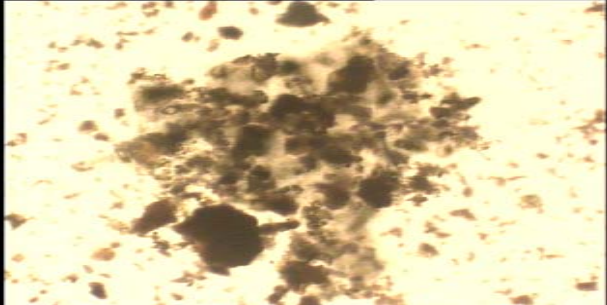




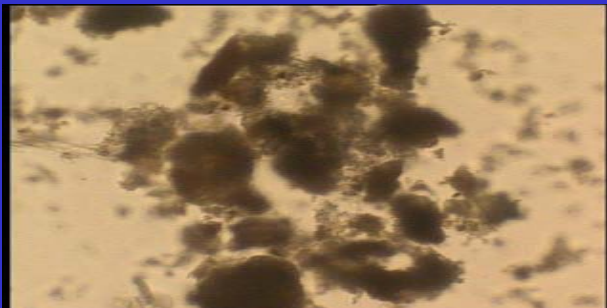
Freshwater



5 min



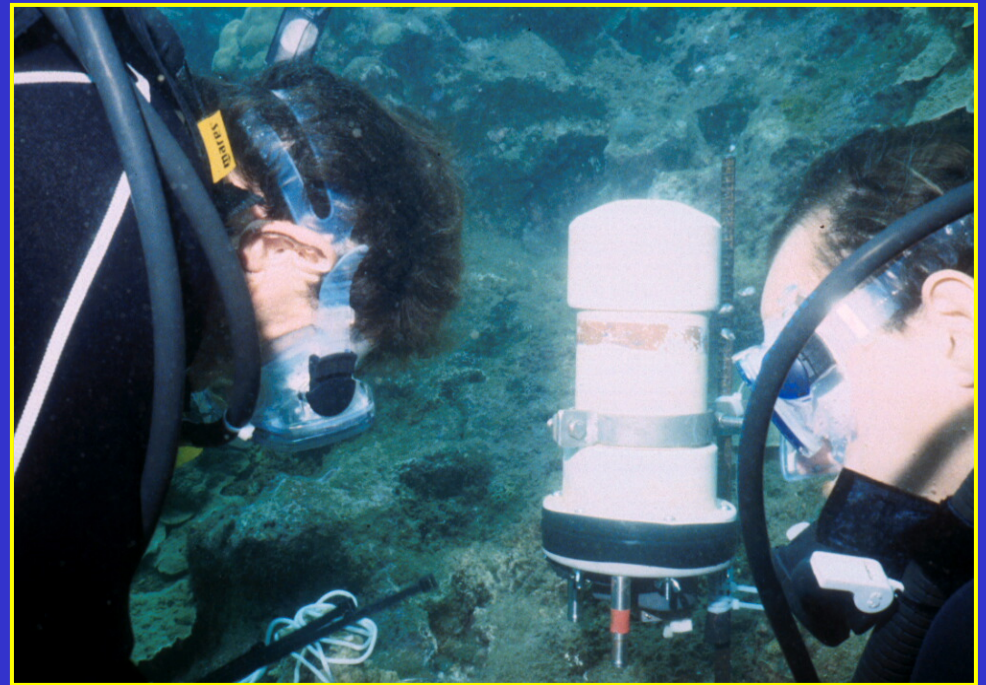
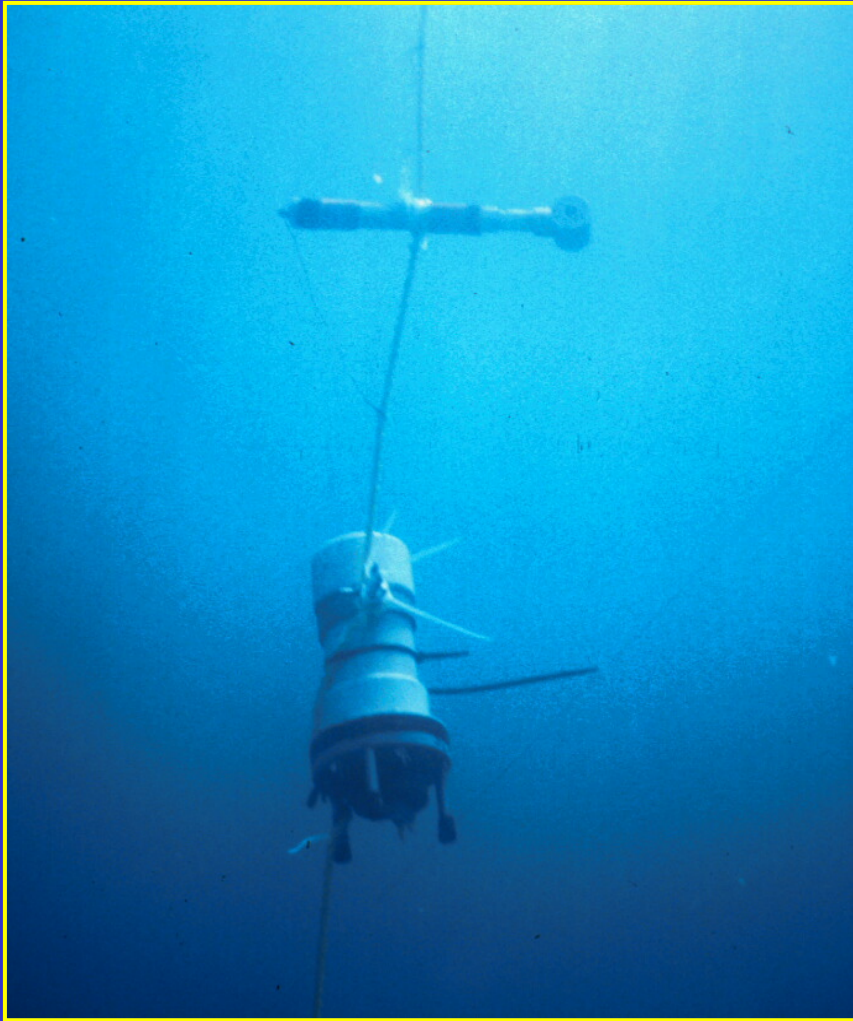
10 min



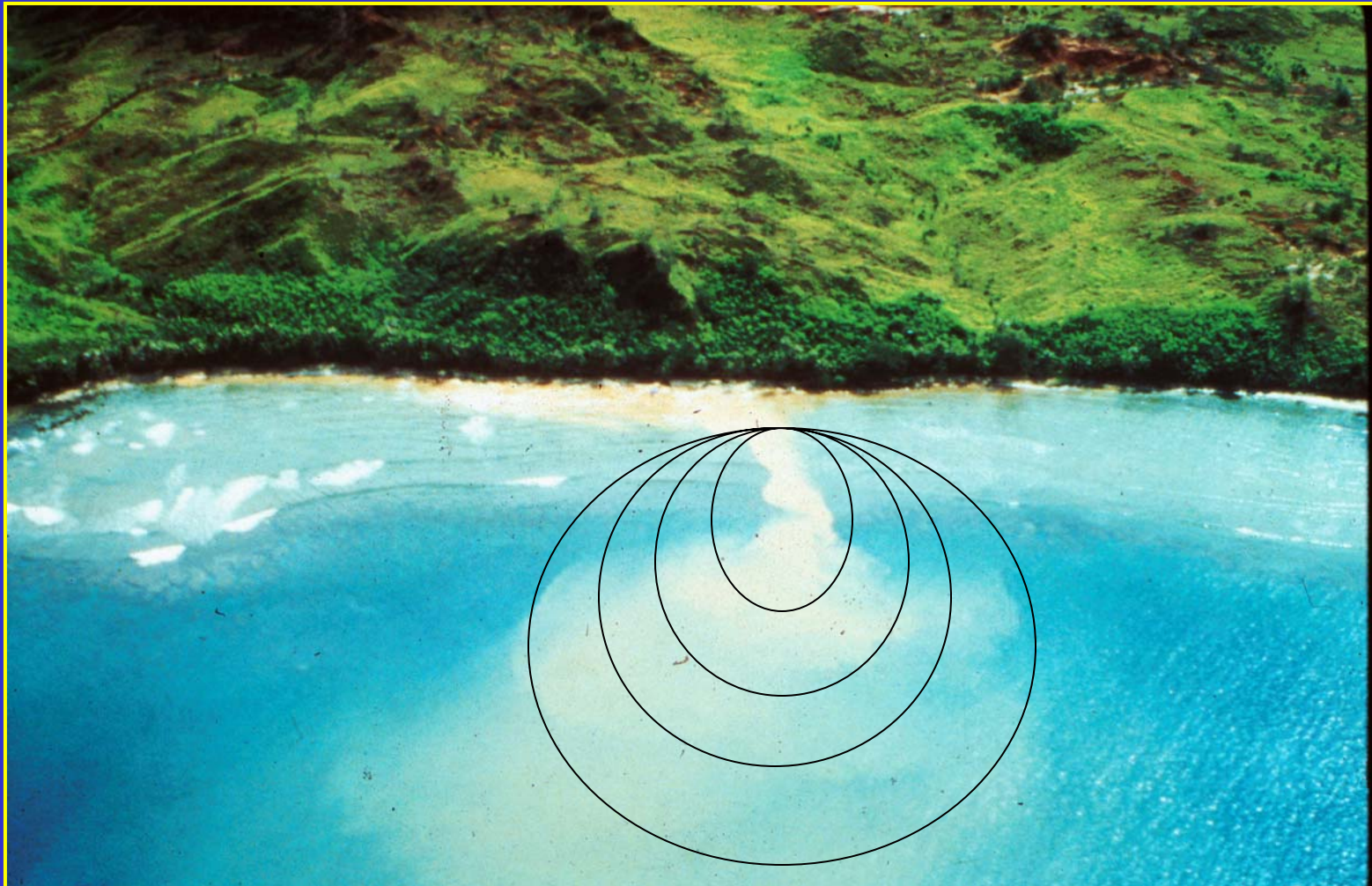
30 min

Width=1000 um

Watershed discharges: Spatial and Temporal



INTEGRATED WATERSHED MNGT

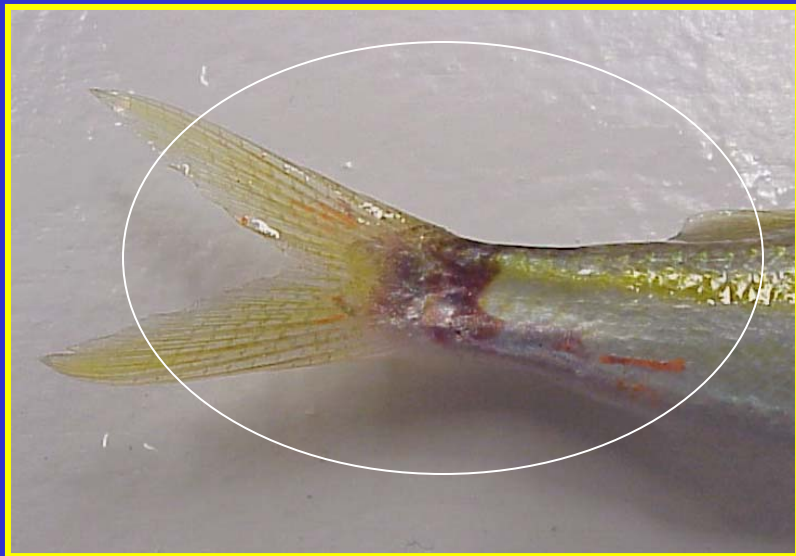


Does spillover from MPAs enhance fishery yields in adjacent exploited areas?



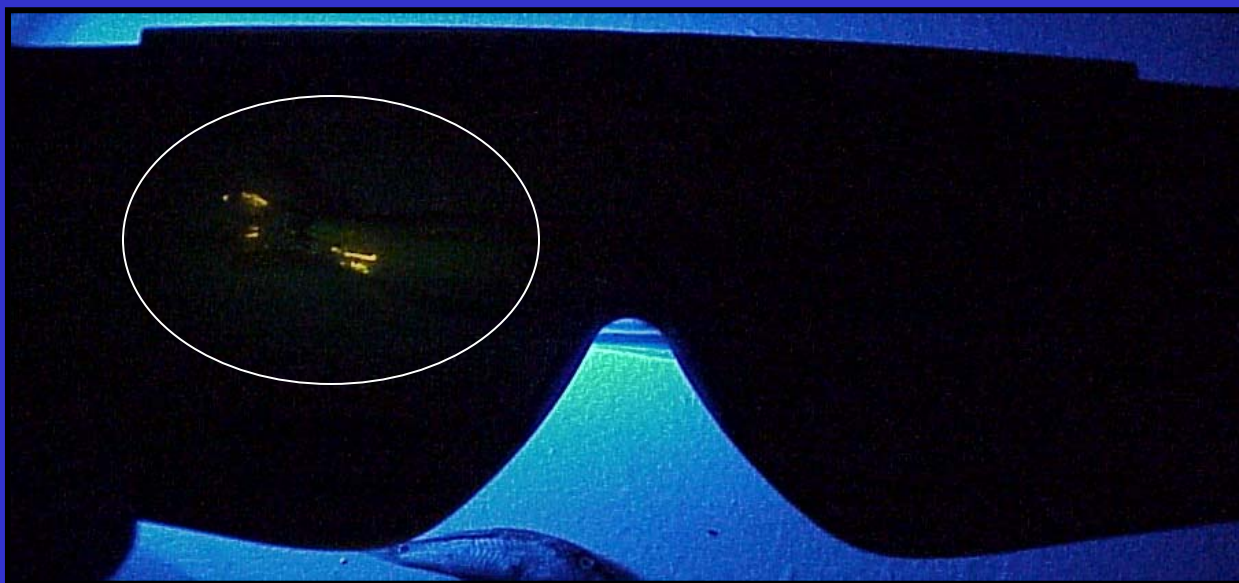
Collecting goatfish from Piti Bombholes Marine Preserve for tagging studies

Elastomer implant tagging

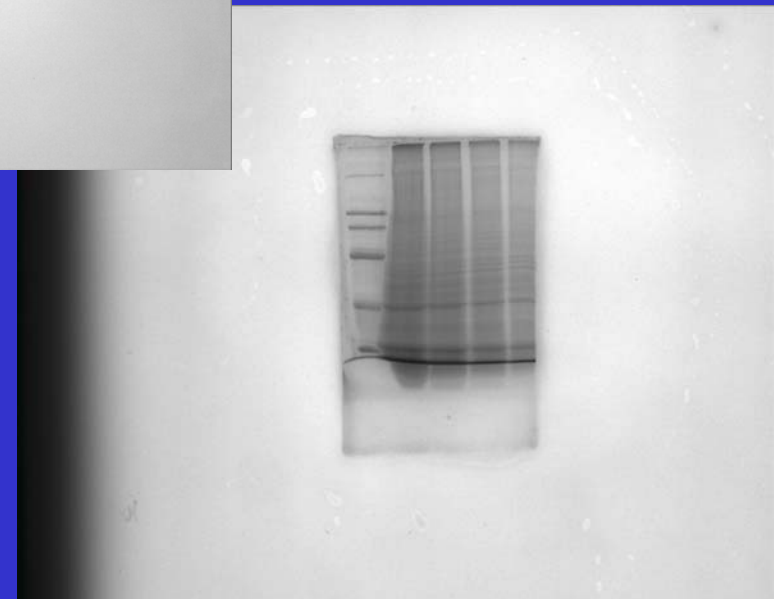
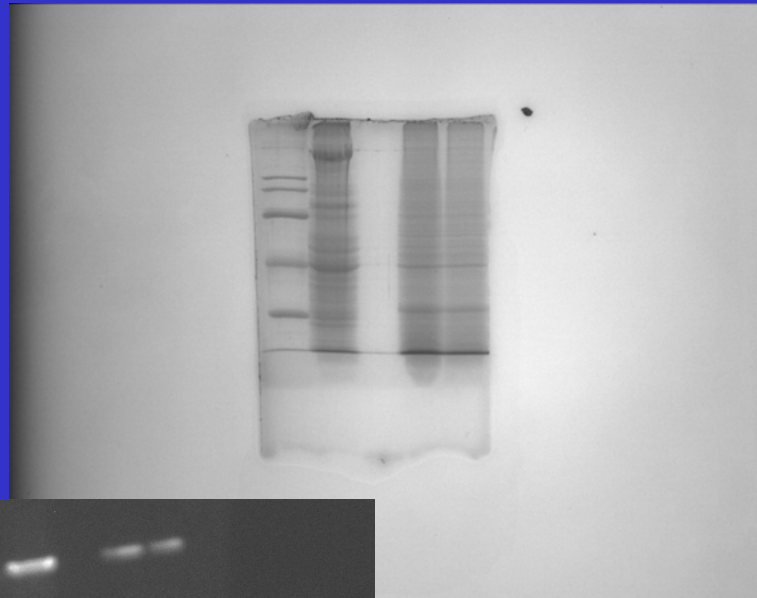


Fluorescent orange implant is visible to the naked eye...

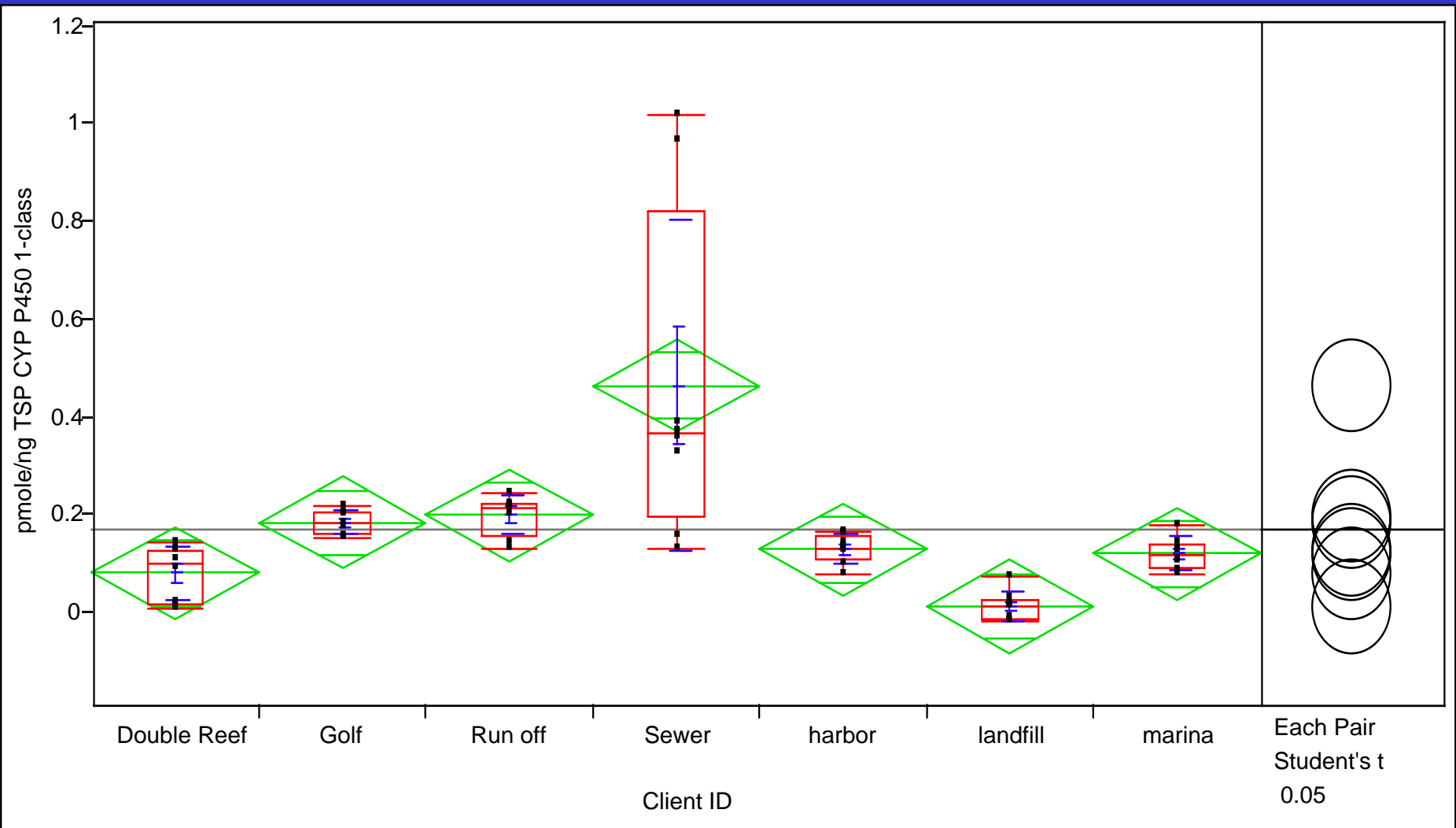
...but is more easily viewed under submersible UV light, using an amber filter



Biomarkers of Environmental Stress – Hsp 70, telomerase, SOD



Biomarkers of Exposure to Pollutants



Credits: Dr. Gary Ostrander, JHU; Craig Downs, EnVirtue

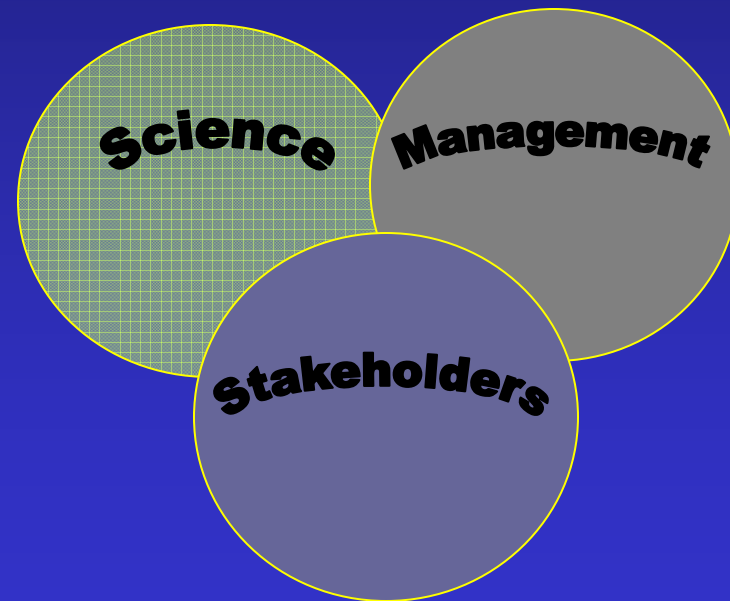
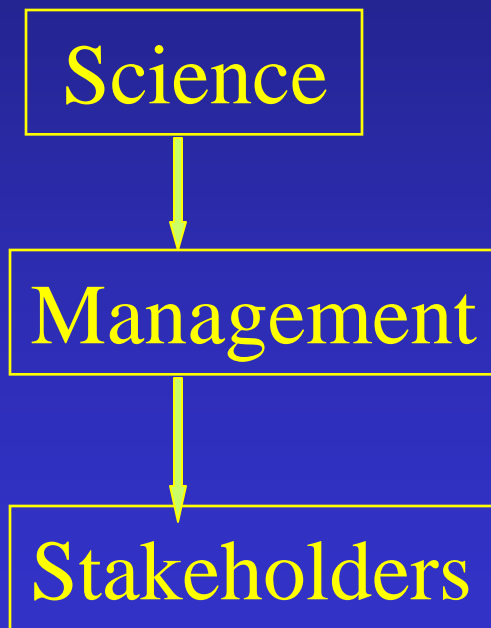
Eutrophication and Algal Overgrowth



Dealing with pollution issues isn't easy

“We never do nothin' nice and easy.....”

Tina Turner circa mid-1970's



Stakeholder Involvement



Community Engagement and Education w/in Cultural Context



Coral Reefs:
An educational outreach project to develop
community awareness and promote
protection of our regional legacy

A Special Project of the
Pacific Daily News
GUAM'S *complete* SOURCE
www.guampdn.com

Value of Traditional Leadership



Ngerikill Watershed - Palau



Relevant Legislation

- 1) 1898 - River and Harbors Act (ACOE)**
- 2) 1958 - Fish & Wildlife Coordination Act**
- 3) 1969 - NEPA**
- 4) 1972 - CZM Act**
- 5) 1973 - Endangered Species Act**
- 6) 1977 - Clean Water Act (EPA/ACE)**
- 7) 1978 - Council of Envir. Quality 40 CFR 1500-1508 Sect. 404(B)(I)**
- 8) Executive Order 13089**

ACKNOWLEDGEMENTS

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NOAA CSCOR/COP/CRES

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