# The Kootenai Tribe's Kootenai River Ecosystem Restoration Project

BPA

## 1994-2012

## Project # 199404900

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**Project Manager**

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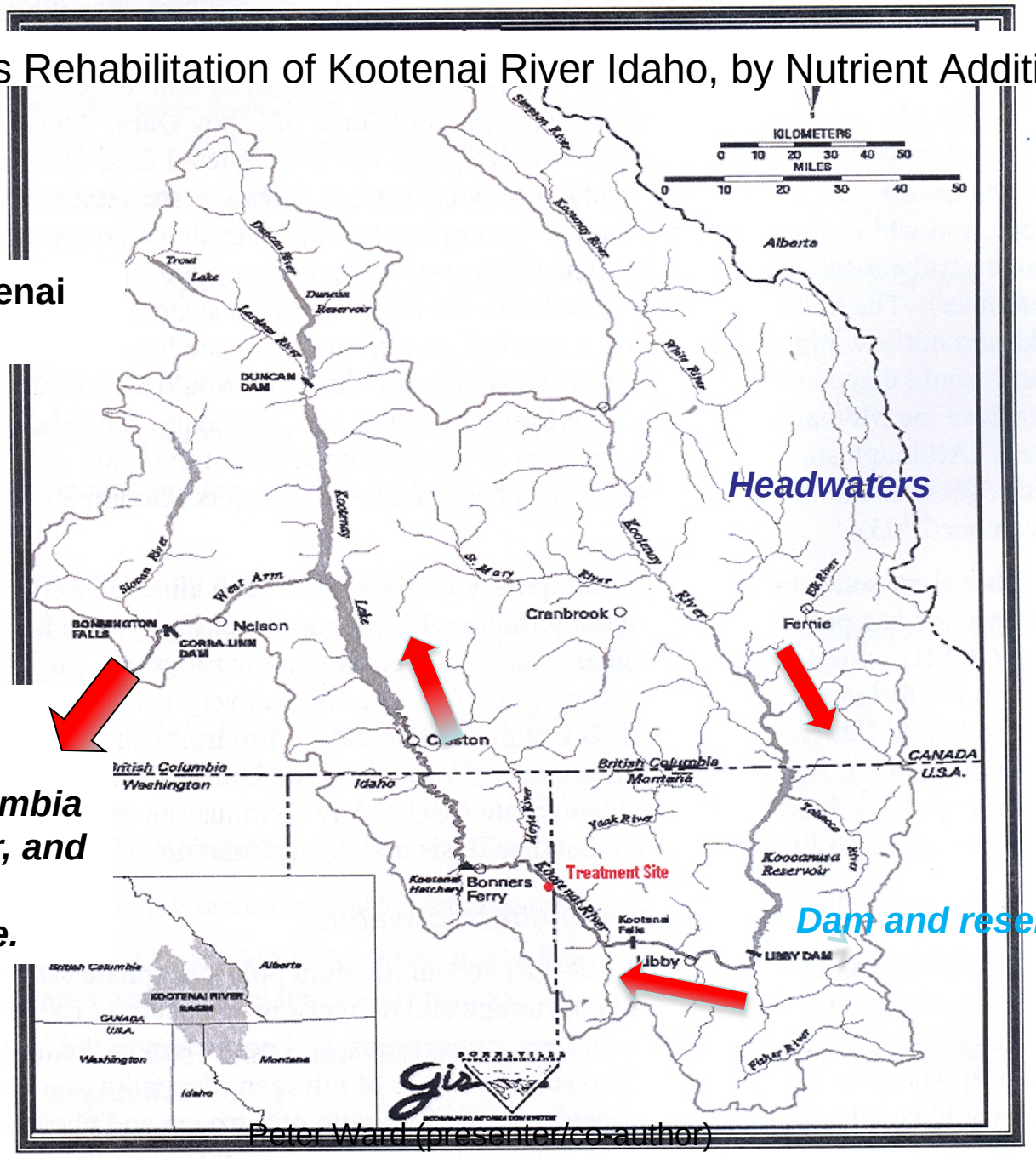
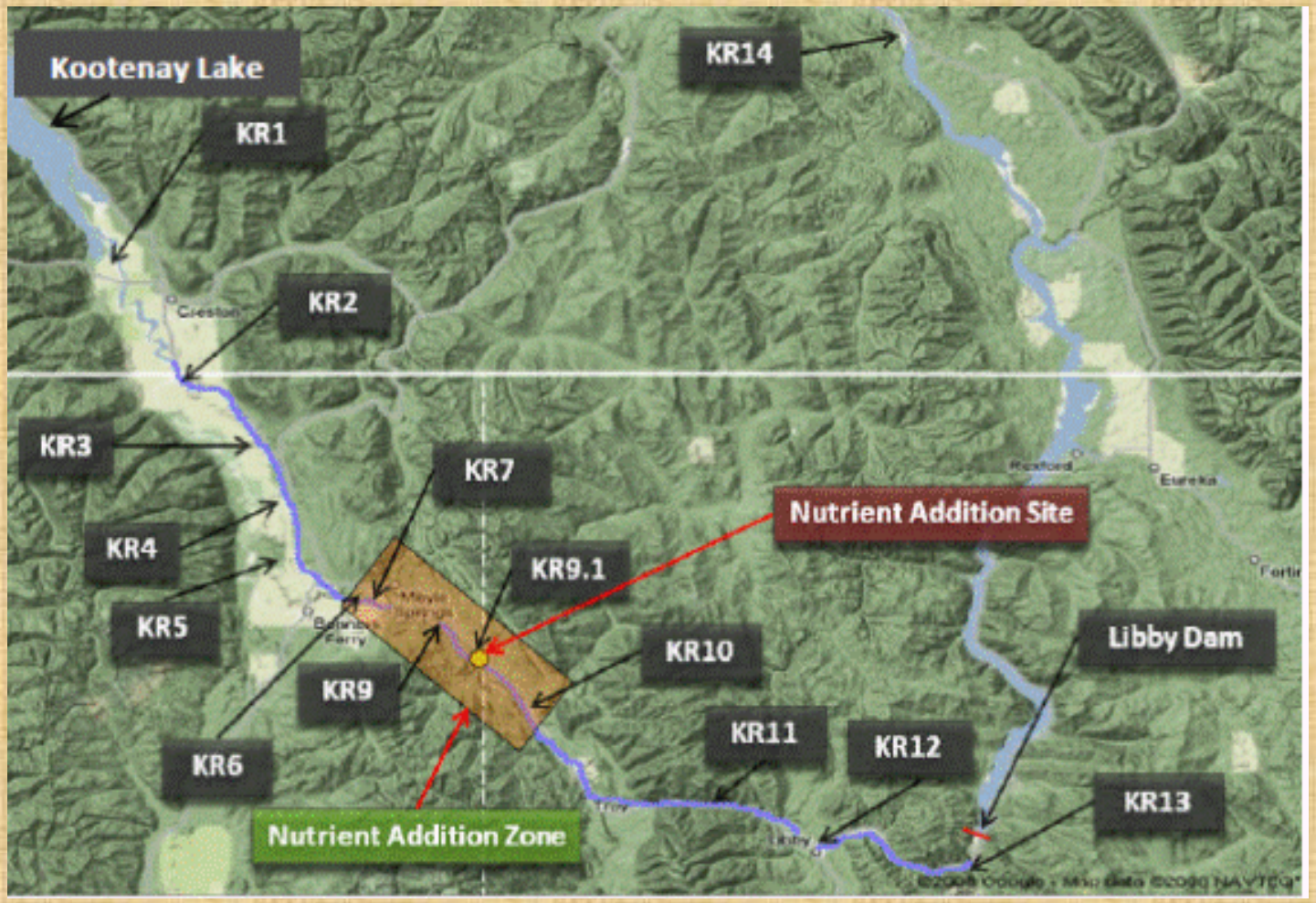
# Fisheries Rehabilitation of Kootenai River Idaho, by Nutrient Addition

**Kootenay-Kootenai River system**




Peter Ward (presenter/co-author)

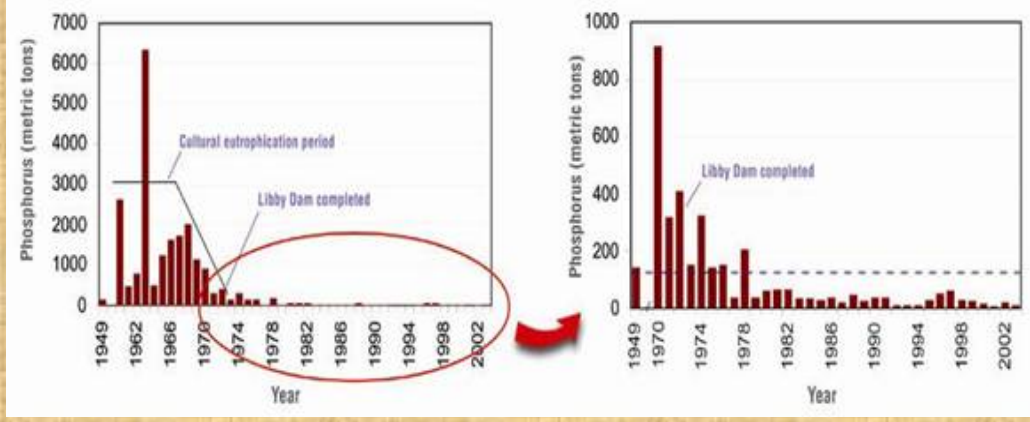
# Quick Look @ Sites;
# Monitoring covers ~ 235 km



# *INTRODUCTION*

- PURPOSE: TO ADDRESS FISHERIES RELATED PROBLEMS AT AN ECOSYSTEM LEVEL AND PROVIDE RESTORATION SOLUTIONS
- IMPORTANCE: PROJECT HAS BECOME MONITORING "VESSEL" FOR KOOTENAI RIVER, ESPECIALLY FOR LOWER TROPHICS & FISH COMMUNITY DYNAMICS
    - PROJECT NOW HAS 10+ YRS OF CONTINUOUS DATA, ALGAL, BENTHIC INVERTEBRATES, WATER CHEMISTRY….FISH COMM.

# *OBJECTIVES*




OBJ-1: **System-wide Biomonitoring and Evaluation of the Main stem Kootenai River**

OBJ-2: **Restore Ecosystem Productivity**

OBJ-3: **Restore Ecosystem Productivity to Kootenay Lake, B.C.**

OBJ-4: **Restore Historically Important Kootenai River Tributary Segments for Key Focal Species**

# HOW PROJECT FITS w/ SIMILAR WORK & BASIN PLANS

- Geographic Region (KR Sub basin Plan Vision)
  - Establish and maintain a healthy ecosystem characterized by healthy, harvestable fish and wildlife populations, normative and/or natural physical and biological conditions, and sustainable human communities (MTFWP-KTOI 2004)
  - Part of Kootenai/y Ecosystem Adaptive Management Plan (KTOI 2011), suite of interrelated KR projects addressing Fish & Wildlife management issues (aquatic/terrestrial)
    - 11 habitat factors and 7 biological factors being addressed (MT, ID, B.C.)
- Similar Work
  - Idaho Dept. Fish/Game, project shares Work Elements of **OBJ-2: Restore Ecosystem Productivity** (Nutrient project)
  - Includes cooperative collection and data sharing of Community-level Fisheries data at 7 sites on KR
  - Shared Management of Nutrient Additions Site
  - Shared hosting of Annual Workshop to discuss Kootenai River results & management Issues

# BRIEF STUDY DESIGN KTOI ECOSYSTEM RESTORATION PROJECT

- BIOMONITORING DESIGN (KOOTENAI RIVER)
  - 235 KM LONGITUDINAL COVERAGE, 12 SITES, COVERING ALL GEOMORPHICALLY UNIQUE REACHES
  - COVERS ALL BIOLOGICAL TROPHIC LAYERS PLUS WATER QUALITY VARIABLES
  - SEASONAL OR MONTHLY DESIGNS/ GROWING SEASON
  - SAMPLE SIZE TESTED
- NUTRIENT ADDITIONS & MONITORING DESIGNS (K. RIVER)
  - ADDITIONS MADE 1 JUNE-30 SEPT (MAINLY PHOSPHORUS)
  - WEEKLY OR BI-WEEKLY SAMPLNG OF PRIMARY PRODUCTIVITY & NUTRIENT LEVELS

# BRIEF STUDY DESIGN KTOI ECOSYSTEM RESTORATION PROJECT

- NUTRIENT ADDITIONS & MONITORING DESIGNS (KOOTENAY LAKE)
  - ADDITIONS (MAINLY NITROGEN), JUNE-AUGUST
  - WEEKLY MONITORING OF NUTRIENTS, PRIMARY, SECONDARY PRODUCTIVITY
  - YEARLY ACOUSTIC MONITORING OF TARGET FISHERIES, KOKANEE, RAINBOW TROUT

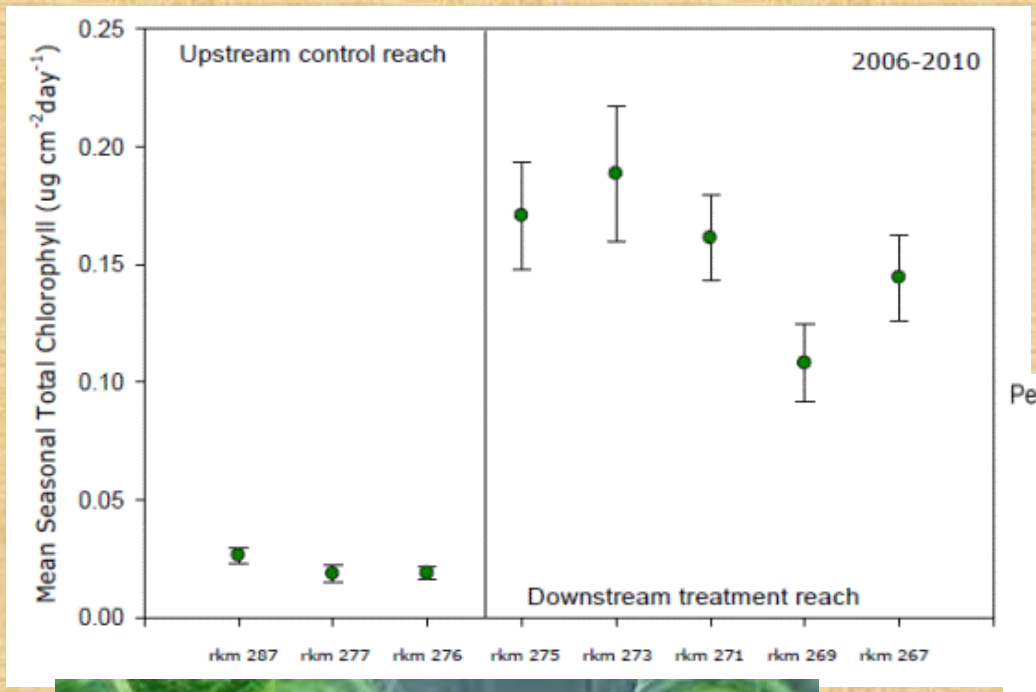
# ANALYSES PERFORMED AND PROPOSED

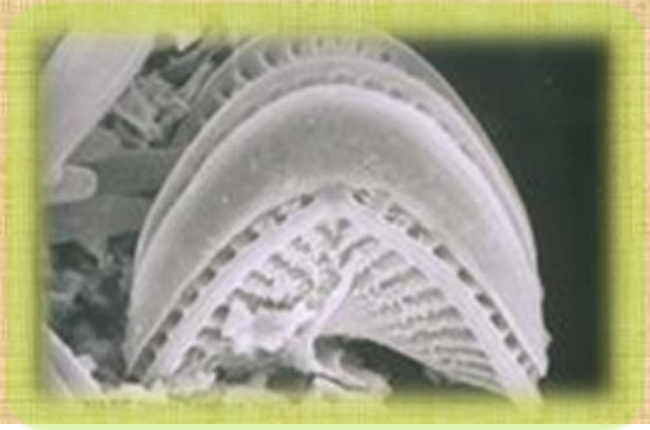
- TREND MONITORING OF WQ SPECIES (6 NUTRIENTS, SOME METALS), ALGAL CHLOROPHYLL LEVELS & COMMUNITY SPECIES DYNAMICS, MACROINVERT COMMUNITY SPECIES DYNAMICS & POPULATION LEVELS (SAMPLE SIZED TESTED, STAT-RIGOROUS)
- TREND MONITORING OF FISH COMMUNITY DYNAMICS & INDIVIDUAL SPECIES POP LEVELS (ALL SPP MONITORED)
- IN COMPOSITE, ALL TROPHIC DATA HAS/WILL BE USED TO ACTIVELY MANAGE NUTRIENT MITIGATION EFFORTS (EG. Nutrient experiment “go-ahead” based on technical team review of 3 yrs monitoring data (2001-2004).
  - Ktoi/idfg have proposed to increase dosage & extend application season based on recent monitoring results (2007-2011).

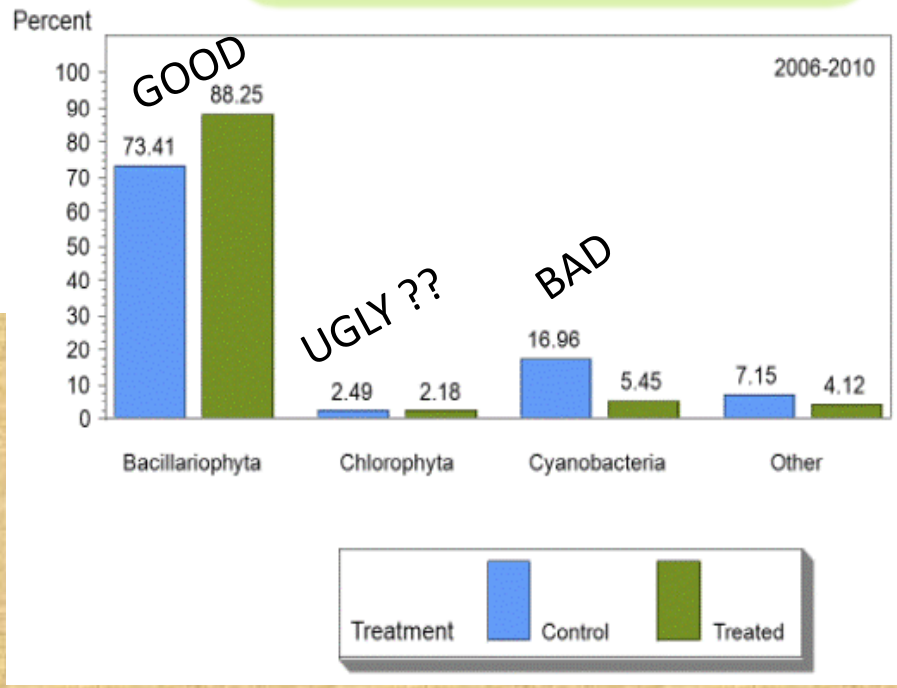
# OVERVIEW ANALYSES PERFORMED AND PROPOSED

- PRE-POST NUTRIENT ADDITIONS TESTING OF NUTRIENT ADDITION ZONE VERSUS REGULATED AND UNREGULATED CONTROLS LOCATIONS ON K.RIVER
  - MEANS TESTING (ANOVA & NON-PARAMETRIC) OF PRIMARY, SECONDARY, AND FISH-LEVEL MONITORING DATA; TO DETERMINE IF NUTRIENT ADDITIONS ARE HAVING A SIGNIFICANT EFFECT ON POPULATIONS
  - PROPOSE TO CONTINUE TESTING TO HELP WITH ADAPTIVE MANAGEMENT OF NUTRIENT ADDITIONS

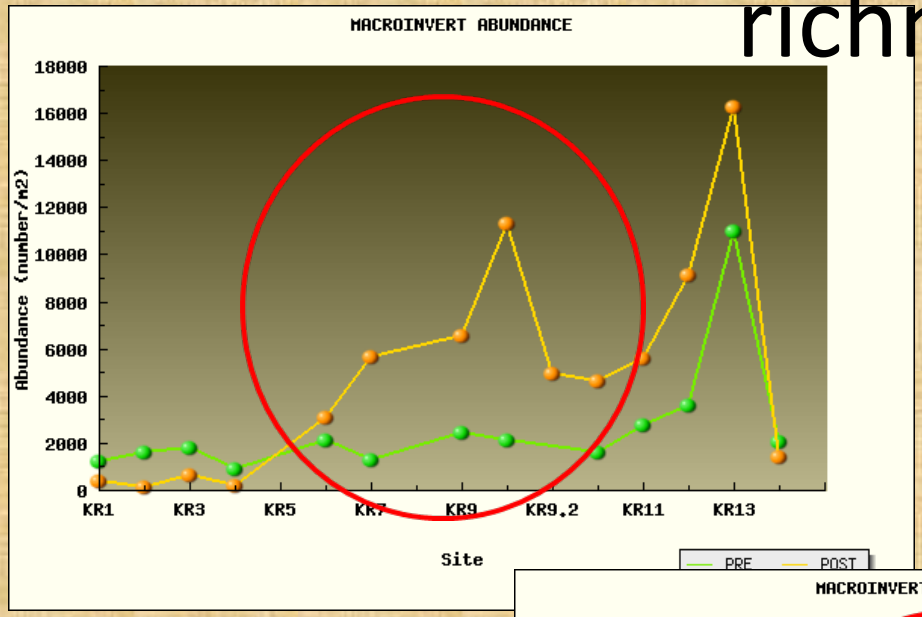
# PRIMARY PRODUCITIVITY
## chlorophyll & species trends



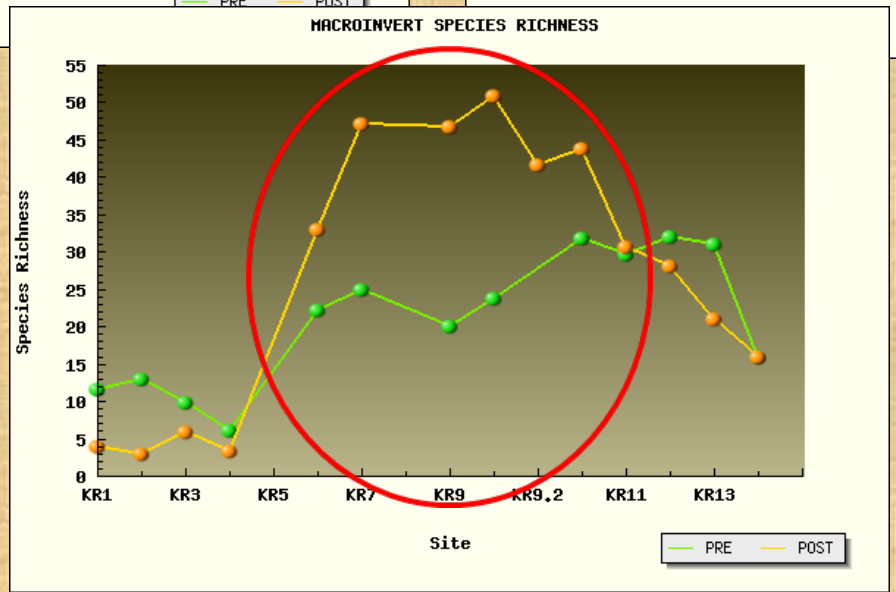





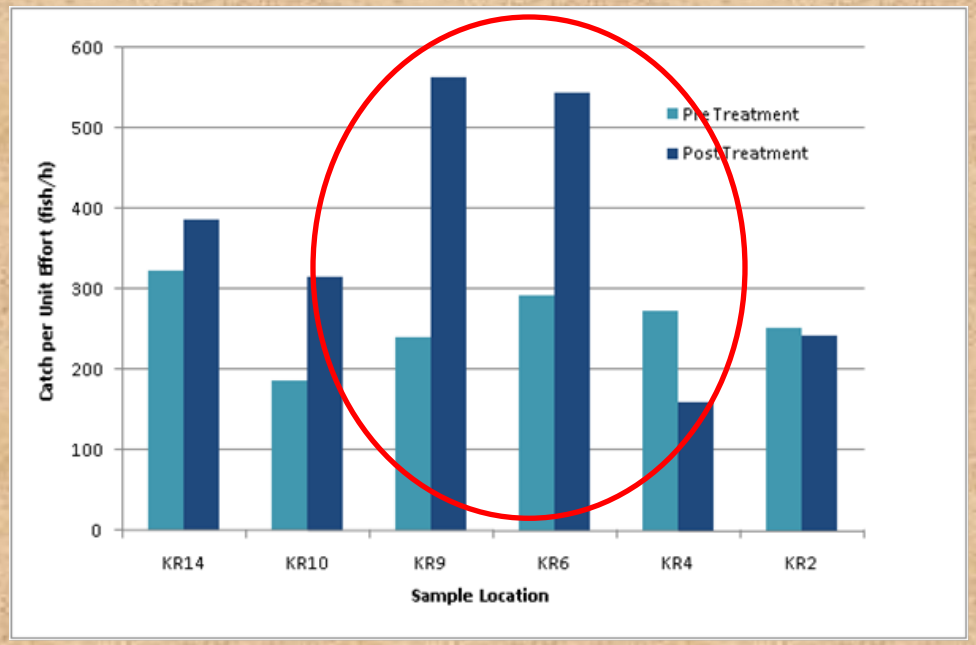

# SECONDARY PRODUCTIVITY (abundance, biomass, species richness)

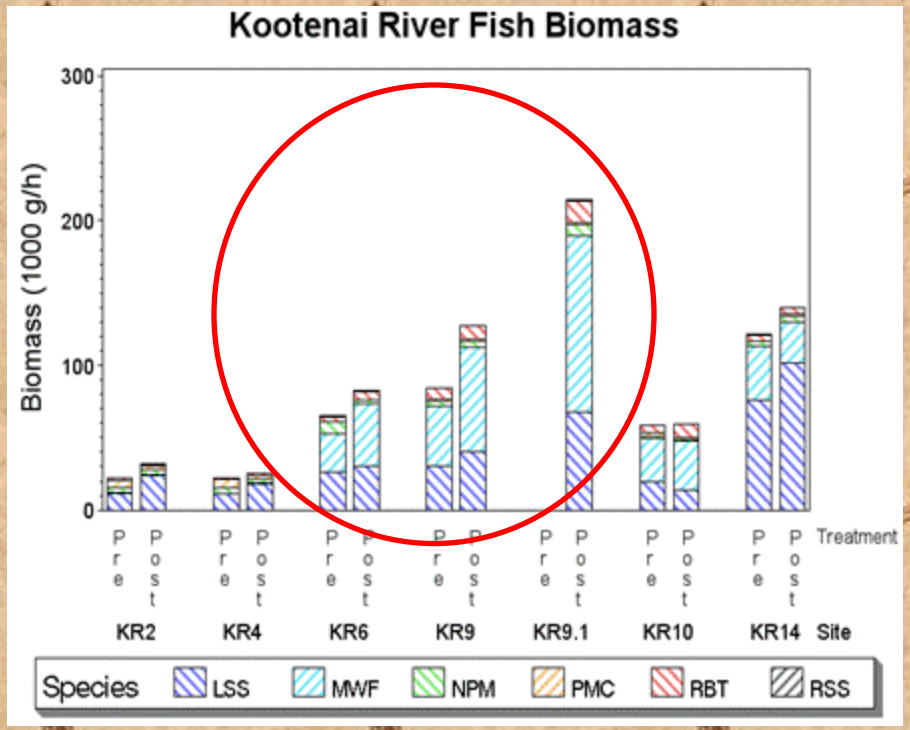







# TERTIARY PRODUCTIVITY
# RELATIVE ABUNDANCE & BIOMASS



# IMPLICATIONS OF RESULTS TO FISH and WILDLIFE MANAGEMENT

- PROJECT SUCCESSFULLY IDENTIFIED NUTRIENT LIMITATION AS A NEEDED MITIGATION ACTION FOR KOOTENAI RIVER (2002-2004) AND SOUTH ARM OF KOOTENAY LAKE (2003)
- ONGOING TROPHIC MONITORING RESULTS ARE USED BY IKERT TEAM (TRIBAL MANAGERS) TO MAKE MANAGEMENT RECOMMENDATIONS FOR NUTRIENT RESTORATION EFFORTS ON RIVER AND LAKE/ YEARLY BASIS

# CONCLUSIONS

- ECOSYSTEM APPROACH SEEMS TO BE WORKING TO IDENTIFY LARGESCALE, SYSTEMATIC ISSUES….
- HAS SIGNIFICANTLY INCREASED ECOSYSTEM PRODUCTIVITY IN NUTRIENT ADDITION ZONE KOOTENAI RIVER & SOUTH ARM KOOTENAY LAKE
  - HOWEVER, SINGLE RESTORATION ACTIONS CAN'T BE VIEWED AS 'SILVER BULLET' (RATHER A MISSING PART OF ECOSYSTEM REPLACED).
- MONITORING A BROAD ARRAY OF METRICS ACROSS BIOLOGICAL, CHEMICAL, & PHYSICAL "ARENEAS" PRODIVING GOOD INFORMATION FOR ADAPTIVE MANAGEMENT  FOR THIS AND POTENTIALLY OTHER BASIN PROJECTS

# KOKANEE RESPONSE: KOOTENAY LAKE; IDAHO TRIBUTARIES