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Invasive Aquatic Species Management Plan Development and Update

Short Term Strategy and Long Term Plan

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Overview

1. Plan purpose and need

2. Scope of Plan

3. Information challenges

4. Short term approach

5. 2007 field study

6. Long term approach

7. Integration

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Purpose and Need

Nonnative fish implicated in decline of native fish world wide

Plan to develop management actions:

> Reduce nonnative fish abundance

> Reduce negative impacts to native fishes

Concern for implementation of TCD/SWS:

> Intended to benefit native fishes, but may increase warm water nonnative fishes

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Scope of Plan

Management plan includes:

- **Aquatic species**
  - **Nonnative fish**
    - Small and large bodied species
    - Warm, cool and cold water species
  - **Crayfish**

- **Geographic scope:**
  - **Mainstem Colorado River in Grand Canyon**
  - **Identification of sources of nonnatives into Grand Canyon**

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The Unknown

Unknowns: How do we respond?

- **Species of greatest risk?**

- **Can monitoring protocols to detect changes?**

- **Effective capture/reduction methods?**

- **Feasibility of control or abundance reduction?**

Hubble image

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# Response Plan

Develop contingency plan:

Respond to nonnative population expansions

- **Current monitoring methods:**
  - **Detect large changes in nonnative fish populations**
  - **Not effective for capture/control**
- **Plan based on literature review of control methods** (mechanical or operational)
- **May not have answers if/when increase occurs**

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Response Plan for Trout

Management of rainbow trout in the LCR aggregation

- **Rainbow trout effectively reduced with electrofishing**

- **Monitor trout CPUE**

- **Implement removal to maintain target abundance**

- **Reduce predation/competition on natives**
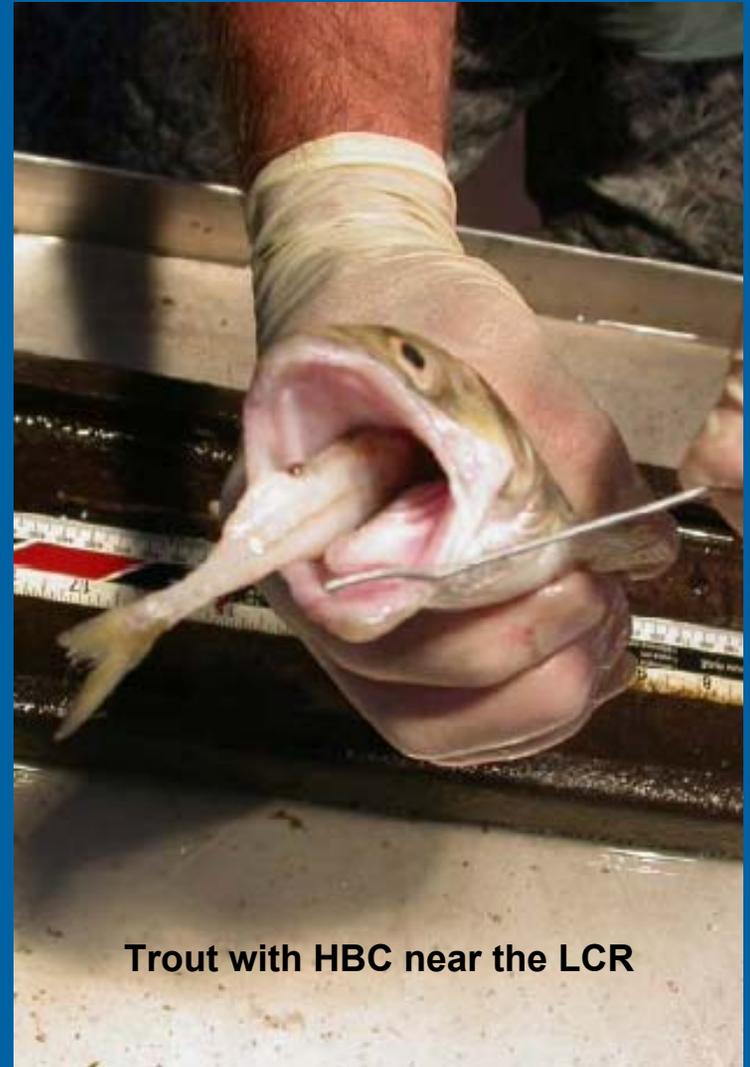
Trout with HBC near the LCR

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2007 Field Study

Combined Warmwater Invasives/Sonic Pilot Project

- **Target species posing greatest risk to natives**
- **Criteria:**
  - Currently in Grand Canyon
  - Warm water expansion potential
  - Current capture methods ineffective

- **FY07 Funding sufficient to study one species**

- **Channel catfish fits these categories for FY 07**

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2007 Field Study

Study Goals and Objectives:

1. **Investigate capture probabilities of channel catfish**
   - **Determine proportion of population captured**

2. **Evaluate three gear types**
   - **Large mesh hoopnets**
   - **Electrofishing with 'catfish settings'**
   - **Standardized angling**

Channel Catfish Removal Program
USFWS 2005

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2007 Field Study

Study Goals and Objectives:

3. Investigate feasibility of using sonic technology to track fish movements in Grand Canyon

Data goals:

- **Habitat preferences**
- **Diurnal, seasonal movement patterns**
- **Application to other species**
- **Species habitat overlap**

Surgically implanting 3 year sonic tag

60 day Sonic tag

Peter J Unmack

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Long Term Strategy

Development of Effective Capture Methodologies

- **Target particular nonnative species**
  - Currently in Grand Canyon
  - Warm water expansion potential
  - Current capture methods ineffective

- **Monitoring and management:**
  - Abundance
  - Movement
  - Investigate effective capture methods
  - Develop novel methods

- **Avoid 'body count' method**
  - Quantify proportion of population removed
  - Identify and quantify native response

'Man-eating' catfish

Flathead catfish from Colorado River near Yuma, AZ

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Long Term Planning

Develop Risk Assessment

Identify nonnative species

of greatest risk to natives

☆ **Efficient application of limited resources**

1. **Environmental tolerance and life history review**

2. **Existing control measures**

3. **Identify negative impacts and interactions**

   ▪ **Predation or competition**

   ▪ **Spatial and temporal overlap**

Fathead minnow

ARKive
Common carp
© Tim Martin / naturepl.com

© Garold W. Sneegas
Plains killifish

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Long Term Planning

Development of Risk Assessment

4. **Utilize temperature-based bioenergetics model to inform risk assessment**

- ▪ **Petersen and Paukert (2005) identify bioenergetics model as useful tool to investigate risk from nonnative fishes in Grand Canyon**

- ▪ **Assess impacts to juvenile and adult natives**
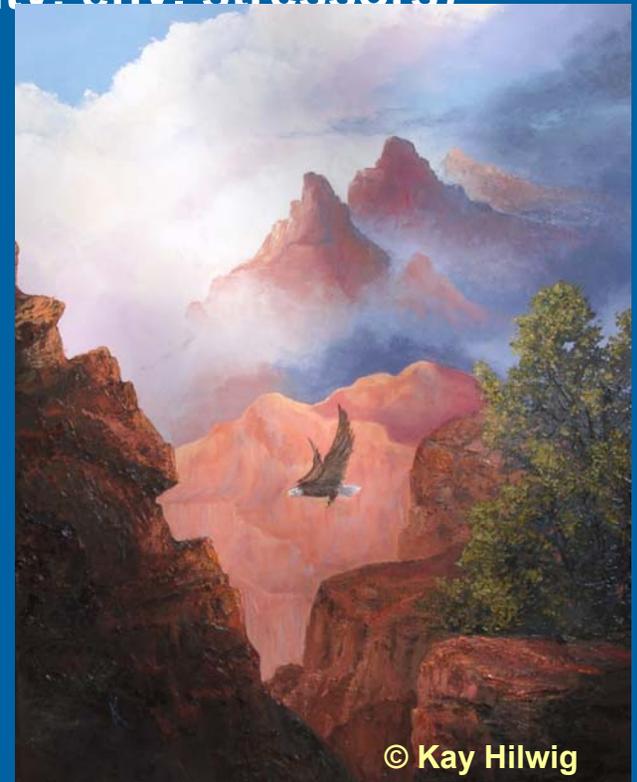
- ▪ **Identify relative importance of impacts**

- ☆ **Incorporate Valdez assessment**

Smallmouth bass

Red Shiner

Green sunfish

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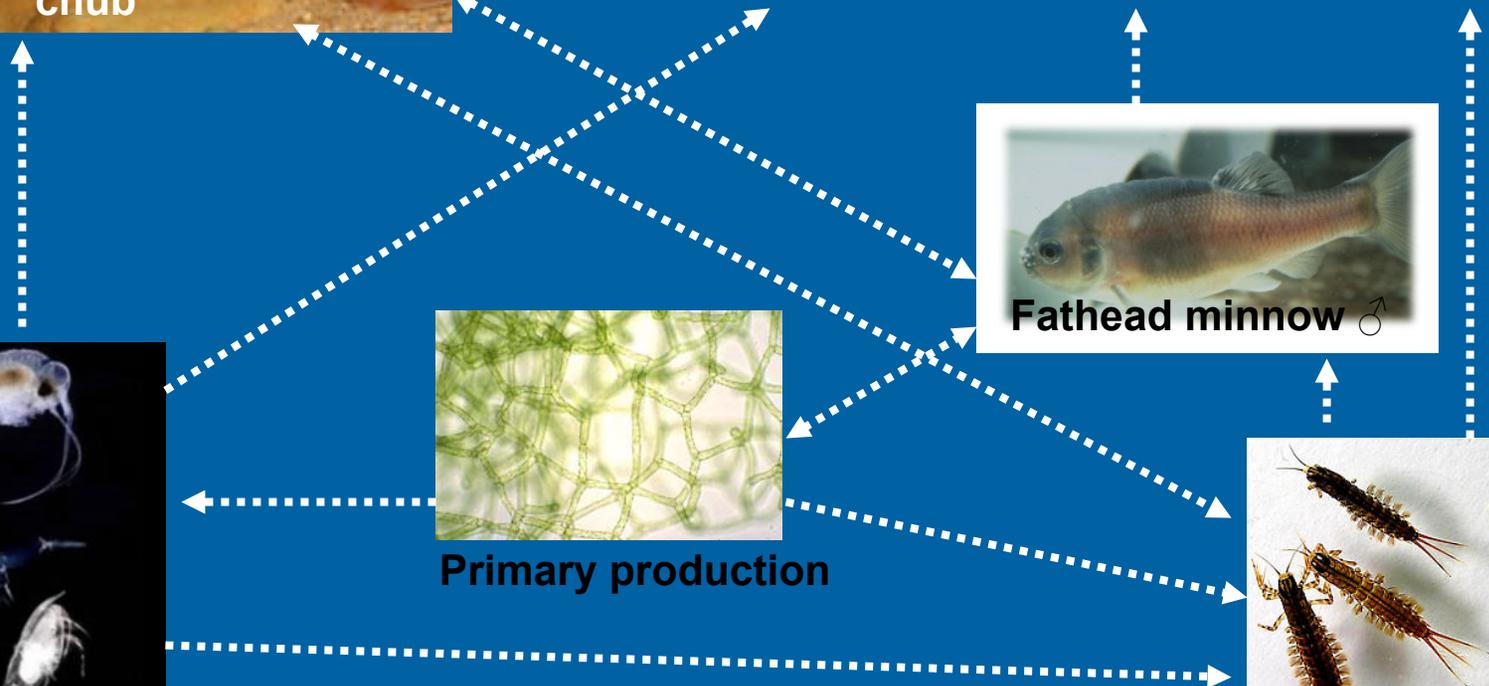
Applications of Bioenergetics

- **Investigate species interactions**
  - **Designate predators, prey, and competitors**
  - **Degree of impact, one species and age class on another**
  - **Identify consumption demand or food limitation**
  - **Define spatial and temporal factors**

- **Evaluate importance of environmental factors**
  (e.g., temperature, food limitation or quality, env. stressors)

- **Investigate Predator/Prey cycles**
- **Rebuild history**
  - **Invasions, management actions**

- **Forecast future**

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Long Term Plan – Bioenergetics Modeling

Juvenile humpback chub

© Garold W. Sneegas

Channel catfish

Fathead minnow ♂

Primary production

Zooplankton

Hypothetical Example

Macro Invertebrates
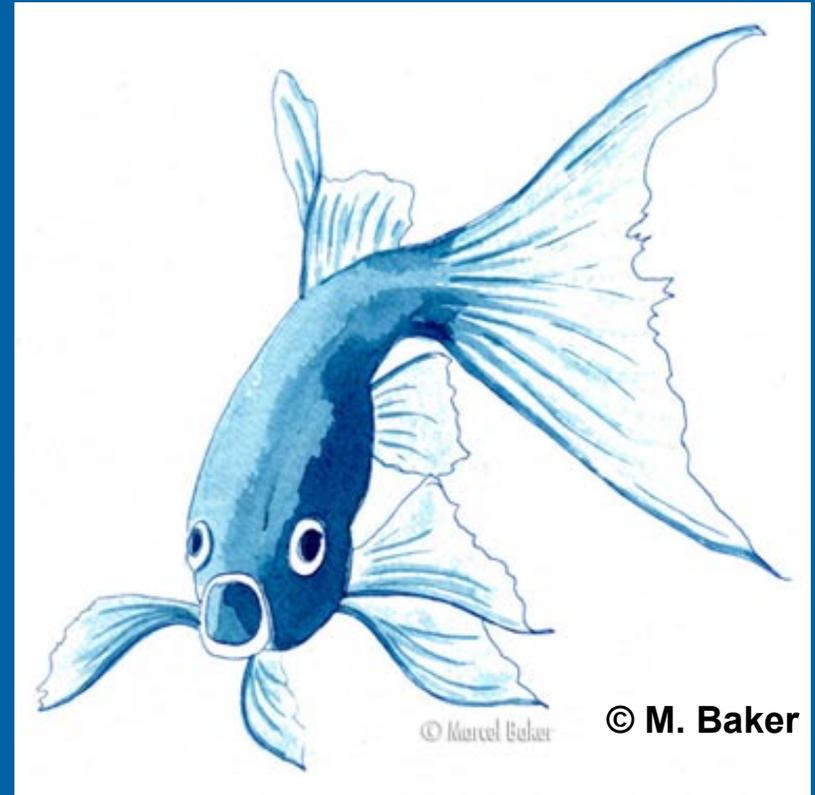
Hypothetical risk assessment scenarios :

Blue Fish Example

Results from Bioenergetics Model inform risk assessment:

- **High predation risk**
- **High invasion risk**
- **High susceptibility to control**

High predation and invasion risk reduced with:

- **Effective control of recruitment**
  (river level fluctuation)
- **Effective capture of adults**
  with electrofishing

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Recommendation: Control blue fish

Hypothetical risk assessment scenarios :

Predation vs. Competition Example

Bioenergetics model for Age 1+ study fish indicates:

- **Red fish population exerts high competitive risk**
- **Moderate predation risk from purple fish population**

Other risk factors:

- **Red fish risk amplified by Low susceptibility to control**
  - **No current effective capture/reduction methods**

Recommendation: Control red fish

Integration

- **Foodbase and nonnative fish programs:**
  - **Model data inputs similar**
  - **End products slightly different**

- **Foodbase is collecting:**
  - **Food availability**
  - **Diet composition**
    - **Gut contents**
    - **Isotope analysis**

- **Programs are also collecting small bodied and juvenile fish:**
  - **Abundance**
  - **Capture probability**

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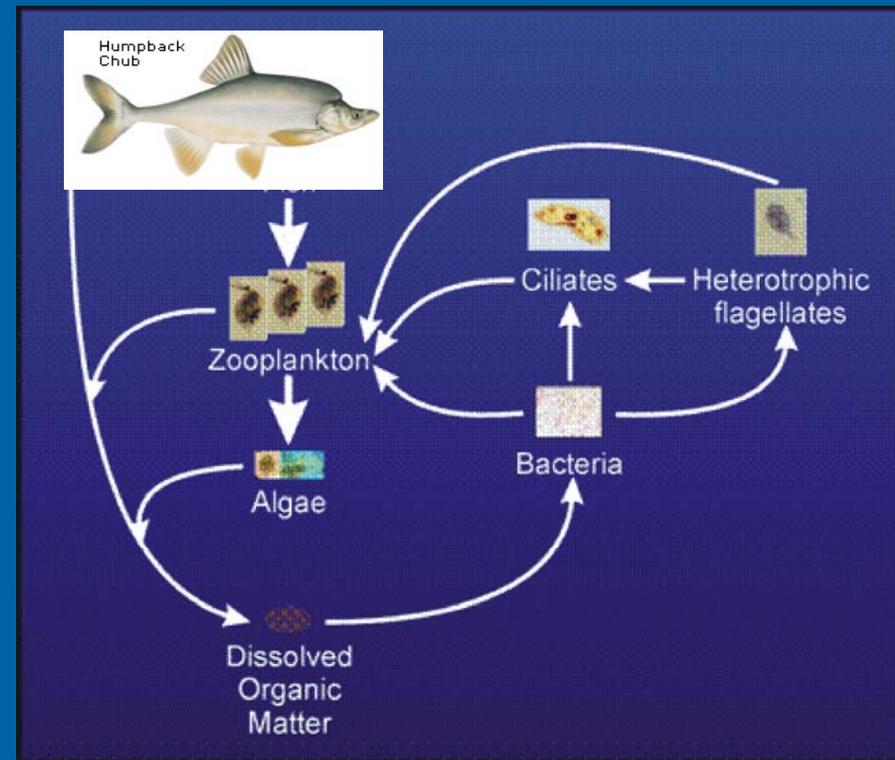
Summary of Approach

Short term approach
- **Response plan**

2007 Field study

- **Investigate capture methods**
- **Improve monitoring and control**
- **Quantify effectiveness and response**
- **Study results inform long term approach**

Long term approach
- **Expand knowledge of monitoring and controlling nonnatives**
- **Identifying impacts to natives**
- **Products:**
  - **Risk assessment document**
  - **Management plan**

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