Colorado River – Aquatic Habitat Studies

BBEST
March 11, 2009

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Overview

- Major accomplishments and study status
- Instream flow recommendations for the lower Colorado River
- Additional Analyses conducted for the LSWP Aquatic Habitat Study
Accomplishments:
- Collected and analyzed extensive physical and biological data on the lower Colorado River
  - hydrology
  - biology
  - geomorphology

Status:
- Complete
Hydrology Activities: Measuring Flow, Depth, and Velocity
Biology Activities: Sampling Aquatic Life

[Images of people engaged in aquatic sampling activities]
Biology Activities: Sampling Aquatic Life

- Over 13,000 individual fish collected
- Representing 50 species
  - Catfish, bass, sunfish, minnows, carp, gar, etc.
◆ Guild – A guild is a group of organisms that are believed to use the same resources in a similar way.
◆ Habitat Guild – A habitat guild is therefore a group of species that use the same habitat types.
Habitat Guild Development: Depth, Velocity and Substrate

Riffles
- Pmir
- Espe
- Mael
- Cano
- Clut
- Cven
- gravel
- silt
- sand

Shallow Runs
- Pcar
- Psci
- Ipuna
- Lcy
- Ccya
- Gaff
- Plat
- Nvol
- Pvig
- Mtre
- Lmeg
- Lmac
- Msal
- Fnot
- silt

Pools/Backwaters
- Deep Runs
- Rapids
- Deep Pools
- Carp
- Celo
- IpunA
- Poli
- MtreA
- Mcon
- Ccar
- IpunB
- Dep
Habitat Guild Development: Species Included

**Riffles**
- Percina sciera
- Percina carbonaria
- Ictalurus punctatus (<180 mm)
- Phenacobius mirabilis
- Etheostoma spectabile
- Campostoma anomalum
- Macrhybopsis spp.

**Deep Runs**
- Pylodictis olivaris
- Ictalurus punctatus (>180 mm)
- Moxostoma congestum
- Micropterus treculii (> 170 mm)
- Carpiodes carpio
- Dorosoma cepedianum

**Shallow runs**
- Cyprinella lutrensis
- Cyprinella venusta
- Pimephales vigilax
- Notropis volucellus
- Micropterus treculi (<170 mm)

**Deep Pools**
- Ictiobus bubalus
- Cyprinus carpio

**Shallow Pools / Edge / Backwaters**
- Micropterus salmoides
- Lepomis megalotis
- Lepomis macrochirus
- Lepomis cyanellus
- Cichlasoma cyanoguttatum
- Gambusia affinis
- Poecilia latipinna
- Fundulus notatus
Habitat Suitability Curve Development

- Habitat suitability curves
  - Developed for each habitat guild

- Technique used
  - Continuous variables – depth & velocity
    - Non Parametric Tolerance Limits
  - Categorical variables - substrate
    - Normalized Frequency Distribution
Example of Depth Habitat Suitability Curve: Riffles
Example of **Velocity** Habitat Suitability Curve: *Riffles*
Example of **Substrate** 
Habitat Suitability: *Riffles*

![Graph showing habitat suitability for different substrates: Silt, Sand, Gravel, Cobble, Boulder, Bedrock. Gravel has the highest suitability.](image-url)
Major Accomplishments: Understanding of the Blue Sucker

Specific Biological Accomplishment:
- Greatly expanded the knowledge base on the state listed Threatened species – blue sucker.

We now better understand:
- Habitat requirements
- Migration patterns
- Spawning (timing, habitat, larval success)

Status:
- Complete
Overview of Blue Sucker Studies

Tagged Adult

Antenna

Eggs

Fry
Overview of Blue Sucker Studies

Fish 149.380
2004 - 2007
Tagged: October 19, 2004
Tagging Location: Columbus

Instream Flow Guidelines for the lower Colorado River

Final Report Completed – Now online

Five Instream Flow Recommendation Categories
  - Subsistence, Base, High Flow Pulses, Channel Maintenance, and Overbanking

Recommendations applied at four locations
  - Austin, Bastrop, Columbus, and Wharton
Subsistence Flow

Represents minimum conditions at which
- water quality is maintained at acceptable levels, and
- aquatic habitats resemble those found during extreme conditions in a natural setting
Provides a range of suitable conditions with goal of
- maintaining year to year variability, and
- maintaining the ecological functions associated with this level of variability
High Flow Pulses

Provides a myriad of ecological functions including:

- nutrient and organic matter exchange
- limited channel maintenance
- flushing
- vegetation scouring
- seed dispersal
Geomorphology Activities Example: Bedload Samples at Different Flows

374 cfs

662 cfs

787 cfs

862 cfs

924 cfs
Channel Maintenance

Provides for:
- maintenance of channel capacity
- flushing of fine sediments from gravel bar and riffle habitats
- scouring of accumulated sediments from pool habitats
Inundates low floodplain areas adjacent to the river for:

- lateral floodplain and riparian connectivity
- floodplain maintenance and nutrient deposition
- recruitment of organic material and woody debris
### Instream Flow Guidelines

#### Flows in CFS

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#### COLORADO RIVER DOWNSTREAM OF AUSTIN

**PULSE FLOWS**
- **Base**
  - Magnitude (2,000 to 3,000 cfs);
  - Frequency (8–10 times annually);
  - Duration (3–5 days)
- **High**
  - Magnitude (@ 8,000 cfs);
  - Frequency (2 Events in 3 year period);
  - Duration (2–3 days)

**CHANNEL MAINTENANCE**
- Magnitude (27,000 - 30,000 cfs);
- Frequency (1 Event in 3 years);
- Duration (3 days)

**OVERBANK**
- Magnitude (> 30,000 cfs);
- Frequency and Duration (Naturally Driven)
Additional analyses conducted for the LSWP Aquatic Habitat Study

- **Uncertainty Analysis**
  - Phase 1 study specific assessment conducted in 2008
  - Phase 2 comprehensive integration scheduled for 2009

- **Climate Change Analysis**
  - Qualitative assessment incorporated into Phase 1 uncertainty analysis
  - Additional qualitative assessment scheduled for 2009

- **Project Alternatives Analysis**
  - With versus without project scenarios
  - To be conducted in Spring 2009
Conclusions

- Valuable physical and biological data has been collected throughout the river and thoroughly analyzed.
- Instream flow recommendations have been finalized with the goal to protect the aquatic health of the lower Colorado River.
  - This includes at Wharton where no existing instream flow requirements exist.
- Instream flow recommendations and aquatic habitat models are available to assess project alternatives.
Comments / Questions