Using Underwater Video to Estimate Salmon and Steelhead Abundance

Kenneth S. Gates
U.S. Fish and Wildlife Service
Kenai Fish and Wildlife Field Office
Soldotna, Alaska
907-260-0126
kenneth_gates@fws.gov

Recent / Ongoing Underwater Video Projects

- Crooked steelhead and Chinook salmon, AK
- Nikolai Creek steelhead and coho salmon, AK
- Funny River steelhead and Chinook salmon, AK
- Soldotna Creek northern pike and steelhead, AK
- Anchor River Chinook and coho salmon, and steelhead, AK
- Tuluksak River salmon, AK
- Kwethluk River salmon, AK
- Goodnews River salmon, AK
- Silver Salmon Creek coho salmon, AK
- Cooper Creek Dolly Varden, AK
- Shantatalik Creek coho salmon, AK
- Quartz Creek Chinook salmon, AK
- Benjamin Creek Chinook salmon, AK
- Slikok Creek Chinook salmon, AK
- Sulf Lake sockeye salmon, AK
- White Salmon River salmon and steelhead, WA
- Milwaukee River sturgeon re-colonization, WI

Outline

- Basic underwater video design
- Examples of video weirs
  - Crooked and Nikolai creek
- Advantages and disadvantages
- Examples of advantages

A Common Underwater Video Design

- Underwater camera
  - Analog
- Digital Video Recorder (DVR)
  - Windows based
  - Stand alone unit
  - Robust motion detection
- Underwater lights
  - 12-V halogen
- Camera box (housing)
- Fish passage chute

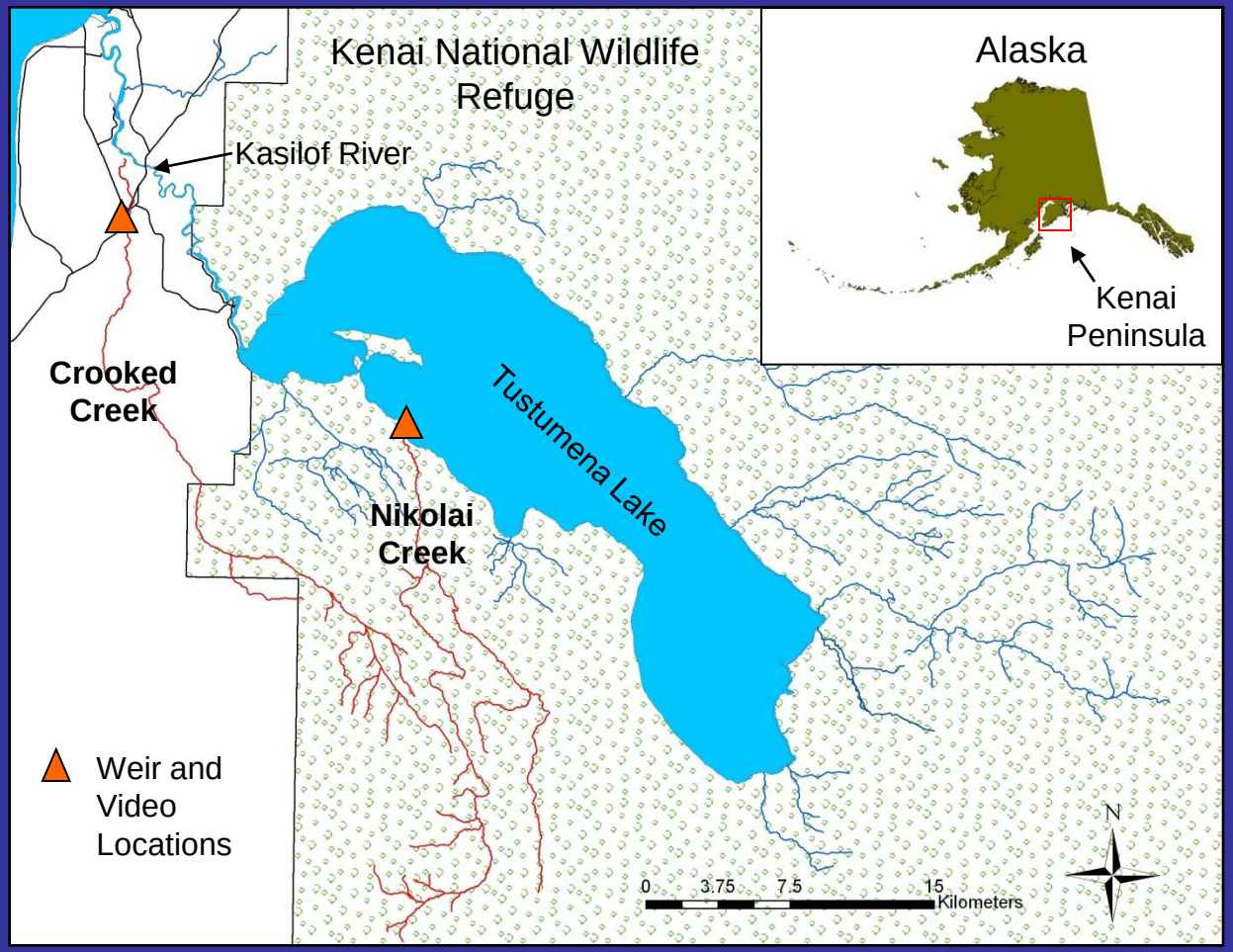
Design Options

- Incorporated into a weir
  - Resistance board
  - Picket
- Incorporated into existing infrastructure
  - Hatchery raceways
  - Natural bottlenecks
  - Fish passes

Design Options (cont.)

- Power
  - 110-V AC shorepower
  - 12-V DC remote power
    - Solar, thermoelectric, wind
- Remote or local application
- Wireless video transmission

Design Examples



Design Options

- **Crooked Creek**
  - Incorporated into existing infrastructure
  - Road accessible
  - Water conditions were controllable
  - 110-V power supply

Design Options

- **Nikolai Creek**
  - Incorporated into a resistance board weir
  - Relatively inaccessible
  - Microwave system
  - 110-V power supply
  - No power on site
    - 12-V
  - Water conditions uncontrollable

Video Costs

- **Crooked Creek**
  - $9,180
    - Camera box and chute
    - Underwater camera
    - Underwater lights
    - DVR
    - Hard drives, etc.
- **Nikolai Creek**
  - $26,080
    - Camera box and chute
    - Underwater camera
    - Underwater lights
    - DVR
    - Hard drives, etc.
    - Solar arrays ($2,000)
    - Batteries ($1,900)
    - Thermoelectric generators ($8,000)
    - Microwave system ($5,000)

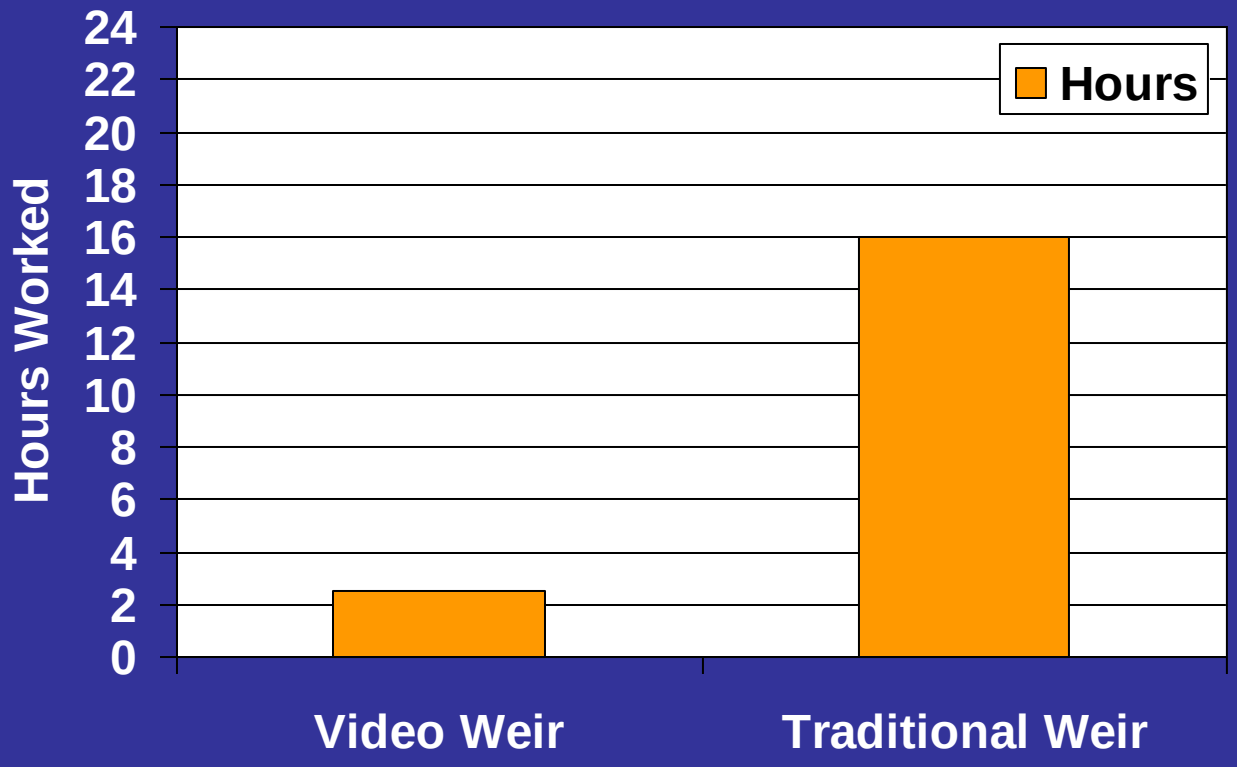
Underwater Video Advantages

- Substantial long-term cost saving
- Operate more projects with less personnel
- Accurate species identification
- More precise escapement estimates
- Unobstructed fish passage
- Fish counts during high flows and turbid water
- More inclusive biological data
- Reduced fish handling
- Can be operated passively or actively

Underwater Video disadvantages

- Initial cost can be expensive
- Potential exists for losing data
  - Power failure
  - Uncertainty of motion detection
    - Potentially biased low
  - Computer software glitches
- Need some electronic aptitude
- Cannot be applied in all situations

Daily Hours Worked



Traditional weir = Staff of 2-4

Video weir = Staff of 1

Accurate Species Identification

Accurate Species Identification

Underwater video

VS.

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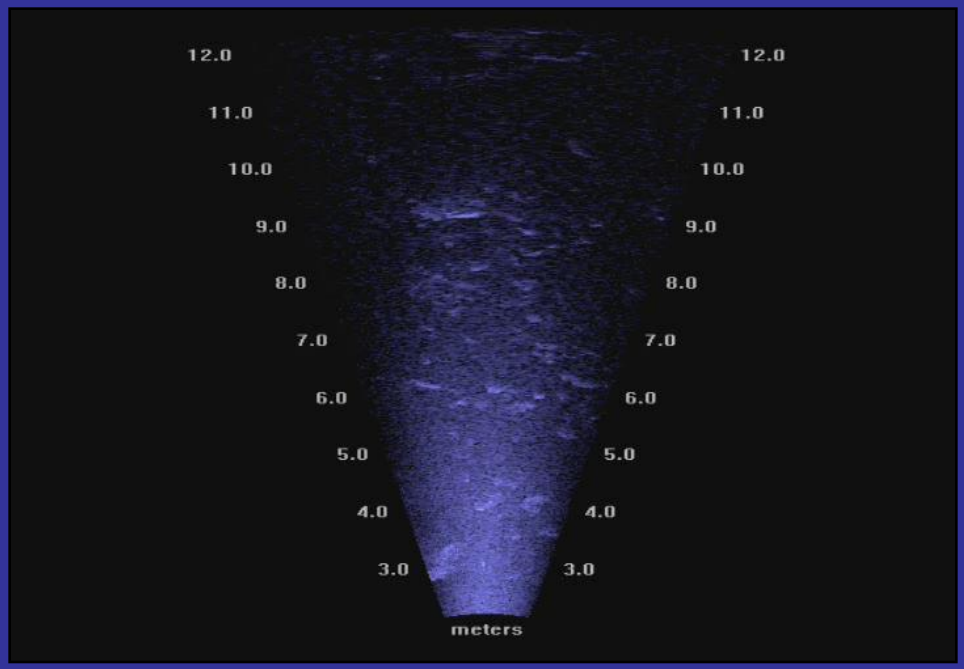
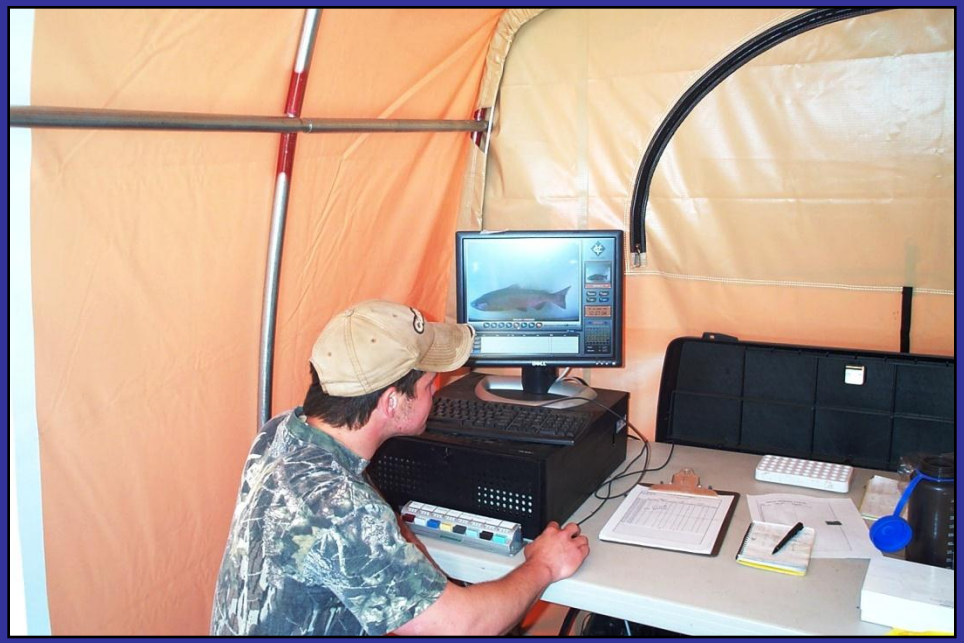


Accurate Species Identification

Underwater video

VS.

Standing at night with a flood light



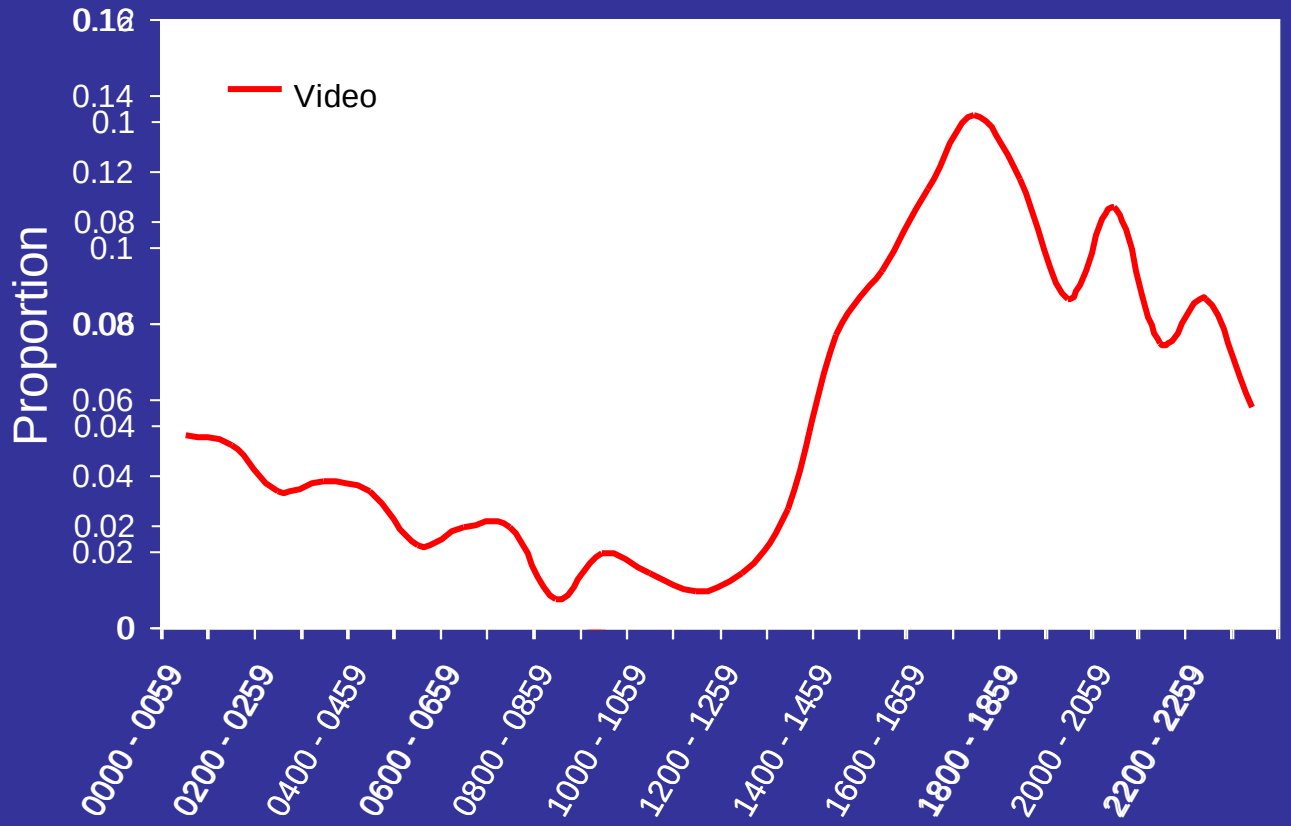
Precise Escapement Estimates

Underwater video

VS.

Traditional weir counts

Unobstructed Fish Passage



- Typical unobstructed Kenai River passage
- Video weir: Funny River Chinook salmon

Fish Counts During High Flows and Turbid Water

More Inclusive Biological Data

- Sex Identification

More Inclusive Biological Data

- Sex Identification
- Marked vs. Unmarked

More Inclusive Biological Data

- Sex Identification
- Marked vs. Unmarked
- Length

Key Summary Points

- Very adaptable and can be incorporated into many existing escapement monitoring projects
- Provides long-term cost savings
- Passive or active operation
- Provides accurate species identification

Questions