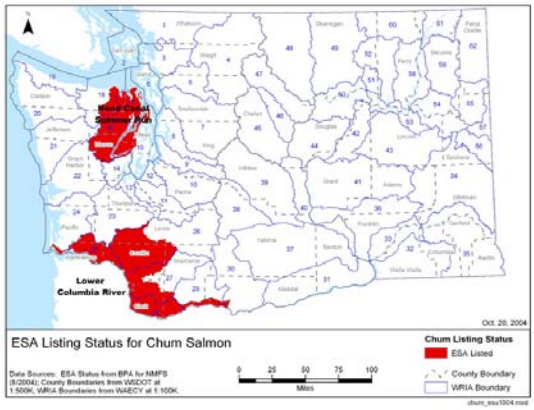
Abundance and Trend of Chum Salmon in Columbia Gorge Tributaries

U.S. Fish and Wildlife Service
Columbia River Fisheries Program Office



Location of study area

- Hardy Creek and Hamilton Springs are located downstream of Bonneville Dam at river KM 227

History of chum salmon work at Columbia River Fisheries Program Office

- USFWS has monitored adult and juvenile chum salmon populations on Hardy Creek since 1997
- 1999 BPA funded CRFPO to monitor chum salmon runs in Hardy Creek and Hamilton Springs

Primary Management Issues

- Effects of hydrosystem operations on chum spawning habitat below Bonneville Dam
- Restoration or creation of spawning habitat in Columbia River tributaries

Current Project Goals

- Examine factors limiting chum salmon production
- Evaluate the relationship between fish spawning in the tributaries and Columbia River
- Enhance and restore chum salmon production in tributaries

Goal 1: Examine factors affecting chum salmon



- Monitor adult and juvenile abundance
- Describe biological characteristics of adult and juvenile chum salmon
- Assess habitat parameters associated with chum salmon spawning

Method: Abundance Estimates

- **Adults**

-Conduct spawning ground surveys

-Enumerate live chum salmon as well as chum salmon carcasses to estimate adult abundance using Area-Under-the-Curve, and a carcass tag mark-recapture technique

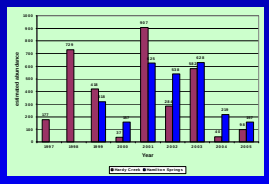
Method: Abundance Estimates

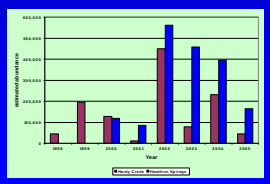
- **Juveniles**

-Capture emigrating chum salmon smolts using stationary and floating fyke net traps

-Calculate trapping efficiency using mark recapture to estimate juvenile abundance

Abundance Estimates

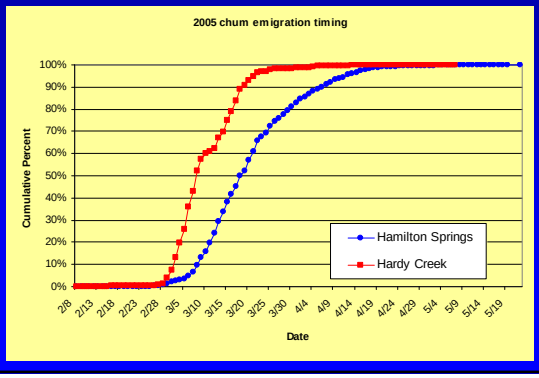




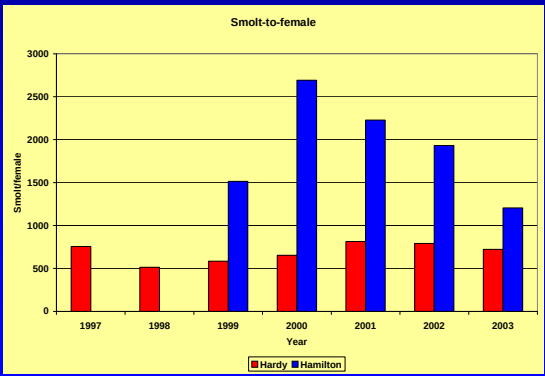

Methods: Monitor trends and variation in life history characteristics


- **Adult** - Collect biological data from carcasses
  - Entry and spawn timing
- **Juvenile** - Emergence rates
  - Emigration timing
  - Length frequencies
- **Production** - Smolt-to-female ratios

Juvenile emigration timing



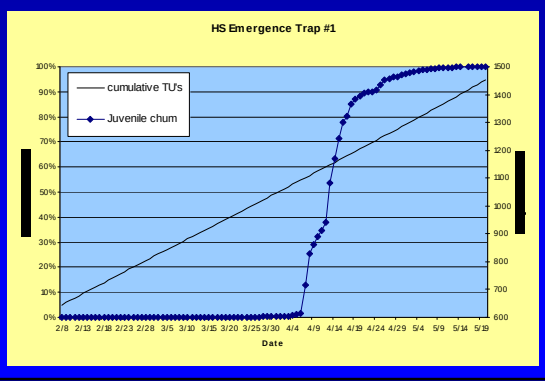
Smolt-to-female ratios



Methods: Assess habitat parameters associated with chum salmon spawning

- **Monitor environmental parameters**
  - stream discharge
  - water temperature
  - intergravel conditions
- **Characterize redds**
  - geo-reference redd locations
  - record water depth, velocity, and substrate composition at use and non-use areas
- **Determine spawn success**
  - install juvenile emergence traps and piezometers
  - monitor TU's and emergence timing

Juvenile Emergence Timing



Goal 2: Evaluate relationship between fish spawning in tributaries and the Columbia River

- Methods:
  - monitor movement among spawning areas using radio telemetry

Goal 3: Enhance and restore chum salmon populations in tributaries

- Methods:
  - September 2000, CRFPO constructed an artificial spawning channel adjacent to Hardy Creek to provide spawning habitat during Columbia River backwater events

Hardy Spawning Channel Summary

- Operated 2001,2002
- Chum passage inhibited by high gradient and water velocity
- Operation limited to normal or high water years
- Installed temporary weir structure at mouth to reduce gradient and velocity
- Assessed feasibility of using alternate water supply
- Operated 1 week Spring 2005 to test effectiveness of weir structures and to document conditions in channel at various flows

Future Direction

- Continue to evaluate the spawning channel and other restoration opportunities
- Perform comprehensive assessment of information collected to date
  - population growth rates
  - survival rates between various life stages

Assessment of Salmonid Populations and Habitat on Tenasillahe and Welch Islands and Assessment of Salmonid Populations and Habitat in mainland Julia Butler Hanson NWR

Study goal: Evaluate the overall effectiveness of JBHNWR slough habitat restoration

- Pre and post restoration evaluation
- Reference and treatment study areas

Assessment of Salmonid Populations and Habitat on Tenasillahe and Welch Islands

- **Tidegates planned for retrofit within Julia Butler Hanson NWR**
- **Other habitat modifications include slough-river reconnection**
- **Benefit for fish?**

Pilot work conducted during summer 2005 followed by data collection in spring 2006

- **"Baci" approach**
  - **Compare treatment and reference sites**
    - **Lewis and Clark NWR**
  - **Compare conditions before and after action**
  - **Fish assemblage**
  - **Habitat conditions**
    - **Sample reaches**
  - **Tidegate operation**

Study goal: Evaluate the overall effectiveness of Tenasillahe island slough habitat restoration

- Pre and post restoration evaluation
- Reference and treatment study areas

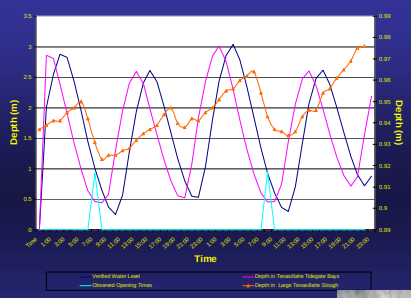
Objectives

1. Assess frequency and duration of time that tidegates are likely to allow passage by juvenile salmonids.
2. Describe presence, distribution, and biological characteristics of salmonids inhabiting sloughs on Tenasillahe (treatment) and Welch (reference) Islands.
3. Characterize habitats in the sloughs on Tenasillahe Island and compare it to that observed at the reference sloughs on Welch Island.
4. Describe the movement of juvenile salmon in and out of the sloughs as well as their residence in and use of the sloughs on Tenasillahe and Welch Islands.

Objective 1: Assess frequency and duration of time that tidegates are likely to allow passage by juvenile salmonids.

Task 1.1: Make inquiries with personnel from various agencies that may have data or anecdotal information about the disposition of the tidegates.

Task 1.2: conduct periodic observations of the tidegates on Tenasillahe Island during various periods during the tidal cycle, over varying tidal extremes, and (if possible) during varying rain events.



- **140 openings between 30 March and 31 July**
  - **100 low tides without opening**
  - **Average 1.1 opening/day, 3.8 hours**

Objective 2: Describe presence, distribution, and biological characteristics of salmonids inhabiting sloughs on Tenasillahe (treatment) and Welch (reference) Islands.

Task 2.1: Identify fish sampling units in each of the four sloughs

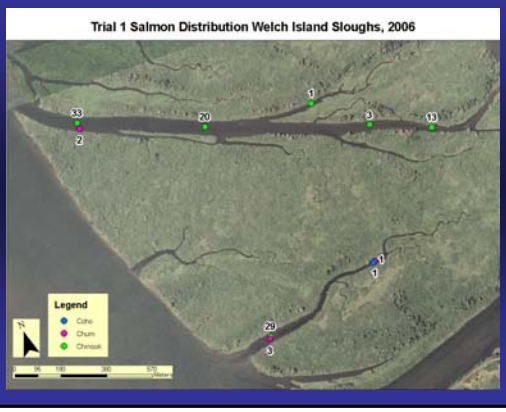
Task 2.2: Conduct a survey of fish at select sampling units and record biological characteristics of fish collected.

Task 2.3: Estimate ability of fish surveys to detect juvenile salmonids by planting marked chinook salmon in sloughs on Tenasillahe and Welch island (will be discussed with objective 4).

80% non-native in gated sloughs

vs.

85% native in reference sloughs



Species and size of salmon captured 2006

Island	Species	Total	Size Range (mm)
Tenasillahe Island	Chinook	1*	46
Tenasillahe Island	Chum	1*	46
Welch Island	Chinook	270	36-195
Welch Island	Chum	6	44-50
Welch Island	Coho	1	47

PIT tagged juvenile salmon release into Large Tenasillahe Slough

	Reach 1	Reach 2	Reach 4	Reach 8
Distance to TG (m)	330	595	1500	2800
% detected	72	77	75	60
Days to detection median (range)	26 (1 – 67)	26 (1 – 68)	26 (1 – 67)	27 (13 – 40)

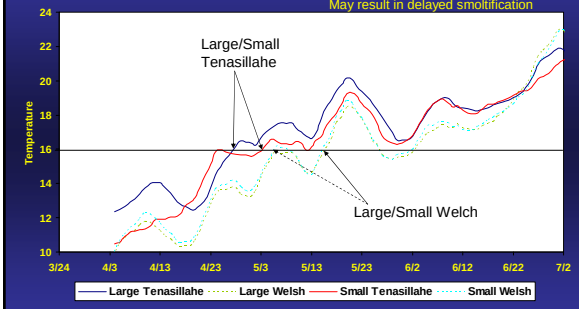
Objective 3: Characterize habitats in the sloughs on Tenasillahe Island and compare it to that observed at the reference sloughs on Welch Island.

- Task 3.1: Describe water quality characteristics in the four sloughs.
- Task 3.2: Describe physical characteristics in the four sloughs.

Water temp comparisons

7-DADM =7-day average of daily maximum

May result in delayed smoltification



Overview of results

- **Tidegate controlled sloughs dominated by non-native species**
- **Juvenile salmonids found throughout reference sloughs**
  - **No salmonids* (almost) found within gated sloughs**
- **Fundamental difference in water regime driving habitat differences.**
  - **Tidally influenced vs. ponded**
  - **temperature, DO, aquatic vegetation, etc**

Study Accomplishments and Questions from 2006

- Contrasted physical habitat and water chemistry between Tenasillahe and Welch sloughs
- Described and contrasted salmonid presence and distribution
  - unsure of annual variation
- Unknown if salmonids can gain access to either small or large Tenasillahe Sloughs with existing tidegate.

2007 Investigations

- Second year pre-construction 2007 to quantify among year variation/verify 2006 findings
  - Habitat including **dissolved oxygen loggers**
- Assess tidegate passage rate
  - Trap at tidegate culverts
  - Measure water velocity during gate opening
- Residence time and use

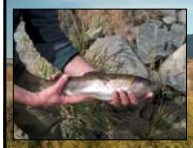
Objective 4: Describe the movement of juvenile salmon in and out of the sloughs as well as their residence in and use of the sloughs on Tenasillahe and Welch Islands

- Task 4.1: Install two PIT arrays in one slough and monitor fish detections throughout the emigration season.
  - Release PIT tagged hatchery fall Chinook into LTS
  - Release fin clipped hatchery fall Chinook into LWS

Assess tidegate passage rate
Trap at culverts

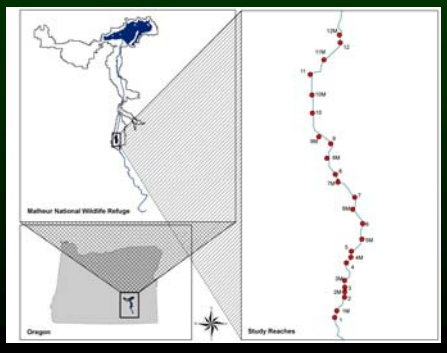
- Trap fish entering slough
- PIT tag salmonids
- Release PIT tagged Chinook (again)
- Operate PIT antenna array

Malheur NWR
Donner und Blitzen River
Habitat Restoration Project



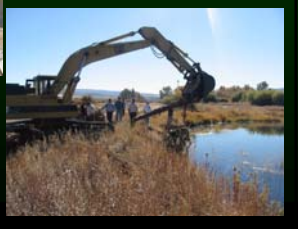
Native Trout Program
Columbia River Fisheries Program Office
Vancouver, WA
April 2007

Donner und Blitzen River



Donner und Blitzen River

Habitat Restoration



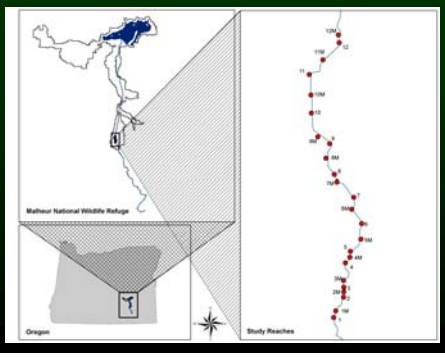
Restoration Benefits

- Redband Trout
- Other native aquatic species

Goal and Objectives

- Goal
  - Evaluate biological responses to stream habitat improvements, with special emphasis on redband trout
- Objectives
  - Describe fish community and compare before and after habitat restoration between reaches with and without structures
  - Describe invertebrate community and compare before and after habitat restoration between reaches with and without structures
  - Characterize physical habitat before and after restoration

Study Area



Monitoring Timeframe

- Pre-restoration monitoring
  - Summer/Fall 2001
- Post-restoration monitoring
  - Fall 2003
  - Fall 2005

Monitoring Components

- Fish
  - Multi-pass depletion boat electrofishing
- Invertebrates
  - Modified kick sample
- Physical Habitat
  - Substrate
  - Width-depth transects

Approach – Fish

- 10 reaches
  - 6 with structures
  - 4 without structures
- Boat electrofishing
- Multiple Pass Depletion
  - 300 ft subreaches
  - Up to five passes

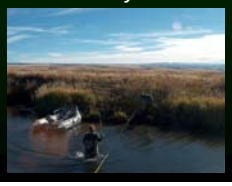
Approach – Invertebrates

- 10 reaches (same as fish)
  - 6 with structures
  - 4 without structures

- Modified kick sample transects
  - Transect located at midpoint of 300m subreach unless structures present
    - Transects relocated to 90 ft above and below strucuture and two transects sampled
  - Samples collected at ¼, ½, and ¾ points along transect

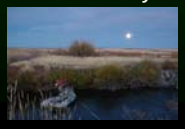
Approach – Physical Habitat

- Substrate
  - 12 reaches (6 with/6 without structures)
  - Transects established at 50 ft above and below subreach midpoint
  - Substrate composition estimated every two feet along transect
    - Clay (slick)
    - Silt/sand (0.004 to 2 mm)
    - Gravel/cobble (> 2 mm)



Approach – Physical Habitat

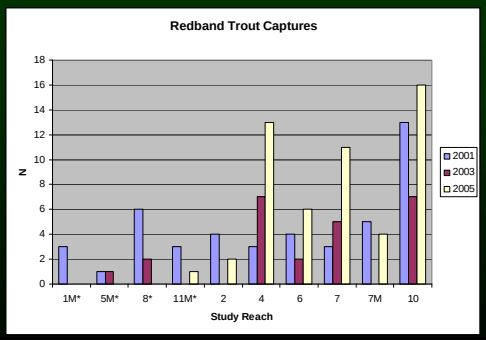
- Width-depth transects
  - All 24 reaches
  - Transect located at midpoint of 300m subreach unless structures present
    - Transects established at 50 ft above and below subreach midpoint
  - Depth recorded in ft every 2 ft along transect



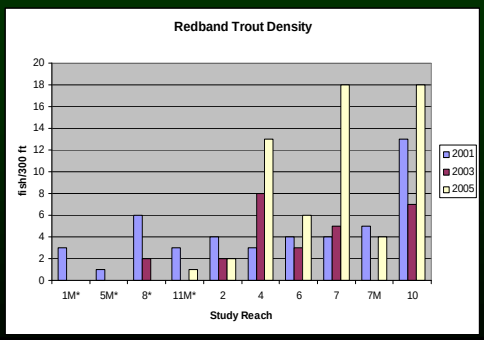
Results – Fish – Total Catch

Species	Year				
	2001 (10 subreaches pre-construction)	2003 (4 subreaches w/out structures)	2003 (6 subreaches w/ structures)	2005 (4 subreaches w/out structures)	2005 (6 subreaches w/ structures)
Redband Trout	45	1	26	1	52
Mountain Whitefish	25		3	9	19
Redside Shiner	7		102	23	363
Sculpin	1		5	1	18
Longnose Dace		1	50	32	195
Bridgelip Sucker		4	16	14	263
Tui Chub		2	2		4
Bullhead			3		14
Green Sunfish					1

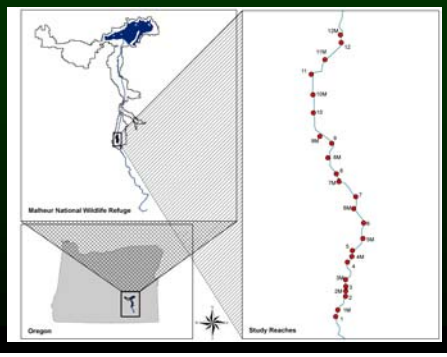
Results – Fish – Redband Trout



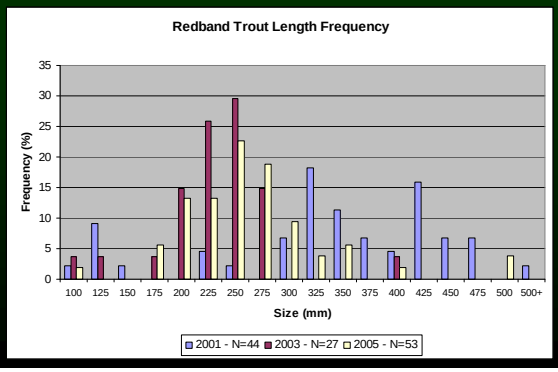
Results – Fish – Redband Trout



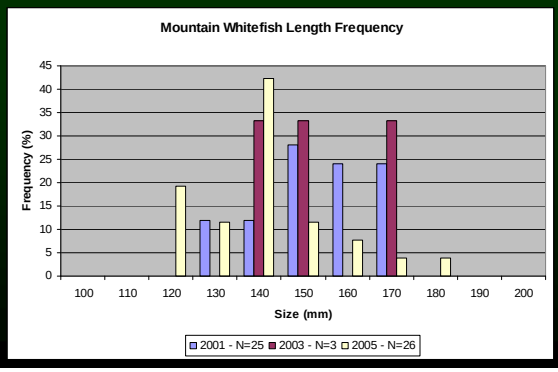
Results – Mark-Recapture



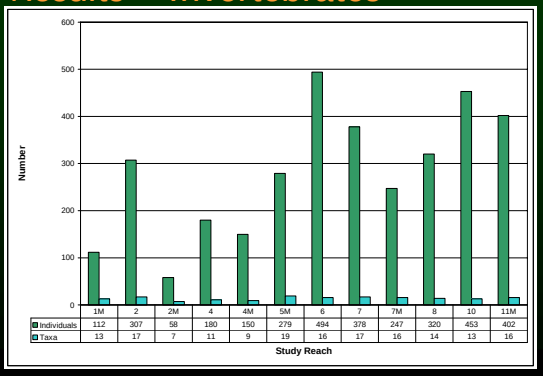
Results – Fish – RBT L-F



Results – Fish – MWF L-F



Results – Invertebrates

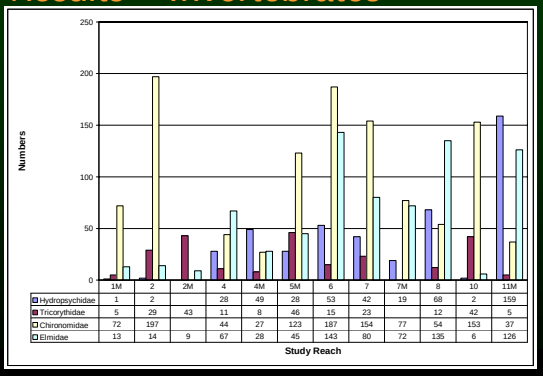


	1M	2	2M	4	4M	5M	6	7	7M	8	10	11M
Individuals	112	307	58	180	150	279	494	378	247	320	453	402
Taxa	13	17	7	11	9	19	16	17	16	14	13	16

Results – Invertebrates

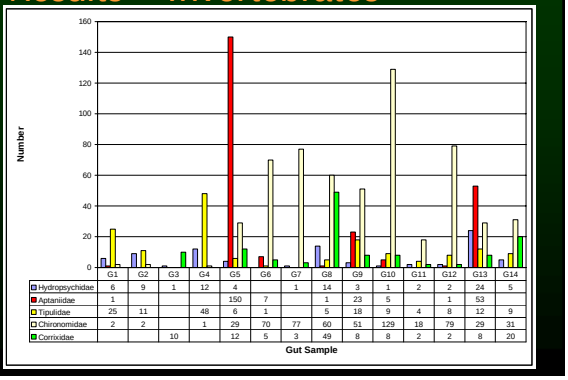
Order	Family	Total Individuals
Plecoptera	Perlodidae	2
	Nemouridae	17
	Chloroperlidae	58
Trichoptera	Hydropsychidae	451
	Lepidostomatidae	4
	Apataniidae	54
	Helicopsychidae	13
	Hydroptilidae	28
	Lepidostomatidae	1
Ephemeroptera	Ephemerellidae	46
	Tricorythidae	230
	Leptophlebiidae	6
	Baetidae	44
	Ameletidae	1
Diptera	Tipulidae	163
	Chironomidae	1122
	Ceratopogonidae	7
	Athericidae	15
	Empididae	4
	Tabanidae	2
	Simuliidae	2
	Stratiomyidae	1
Coleoptera	Elmidae	738
	Hydrophilidae	3
Megaloptera	Sialidae	4
Hymenoptera	Terrestrial Wasp*	1
Anisoptera	Gomphidae	7
Oligochaeta	*	195
Bivalvia	Sphaeriidae	160

Results – Invertebrates



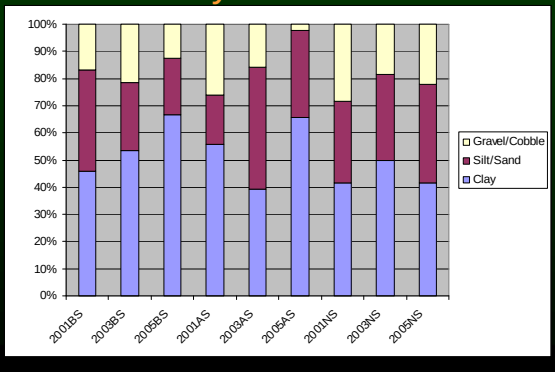
	1M	2	2M	4	4M	5M	6	7	7M	8	10	11M
Hydropsychidae	1	2		28	49	28	53	42	19	68	2	159
Tricorythidae	5	29	43	11	8	46	15	23		12	42	5
Chironomidae	72	197		44	27	123	187	154	77	54	153	37
Elmidae	13	14	9	67	28	45	143	80	72	135	6	126

Results – Invertebrates

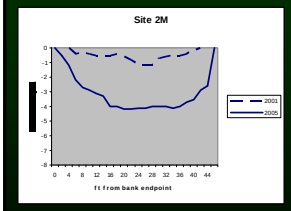


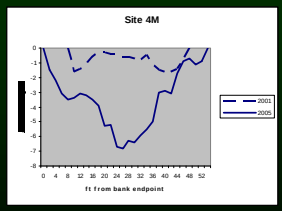
	G1	G2	G3	G4	G5	G6	G7	G8	G9	G10	G11	G12	G13	G14
Hydropsychidae	6	9	1	12	4		1	14	3	1	2	2	24	5
Aptaniidae	1				150	7		1	23	5		1	53	
Tipulidae	25	11		48	6	1		5	18	9	4	8	12	9
Chironomidae	2	2		1	29	70	77	60	51	129	18	79	29	31
Corrixidae			10		12	5	3	49	8	8	2	2	8	20

Results – Physical Habitat



Results – Physical Habitat





Conclusions

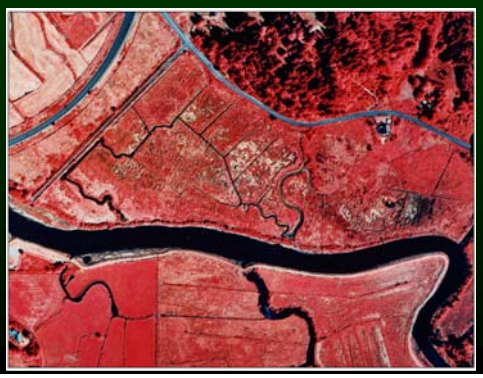
- Qualitatively, habitat complexity structures increased habitat diversity through the study area.
- There was an increase in fish species diversity after construction as well as between reaches with and without structures.
- Alternative sampling and analytical methodologies may provide a better opportunity to assess biological and physical response to similar habitat restoration projects in the Donner und Blitzen River.

Nestucca Bay NWR
Habitat Restoration Project

Native Trout Program
Columbia River Fisheries Program Office
Vancouver, WA
April 2007

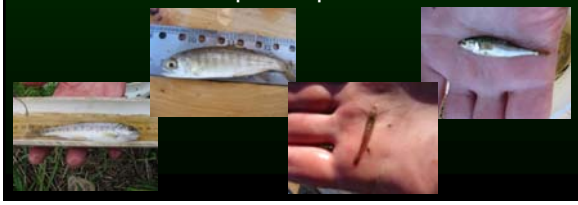
Nestucca Bay NWR

Habitat Restoration



Restoration Benefits

- Coastal Cutthroat Trout
- Coho, Chinook, and chum salmon and steelhead
- Other native aquatic species



Goal and Objectives

- Goal
  - Evaluate physical and biological response to habitat restoration
- Objectives
  - Quantify physical characteristics of aquatic habitats relative to suitability for native trout and other salmonids before and after habitat restoration
  - Describe native trout and other salmonid use of the site before and after habitat restoration
  - Collect invertebrates from representative aquatic habitats before and after habitat restoration

Monitoring Timeframe

- Pre-restoration
  - Winter-early summer 2007
  - Other data available
- Post-restoration
  - Fall 2007 – Summer 2008

Monitoring Components

- Physical
  - GIS analysis of physical attributes
- Fish
  - Hoop nets
- Invertebrates
  - Benthic
  - Pelagic
  - Terrestrial

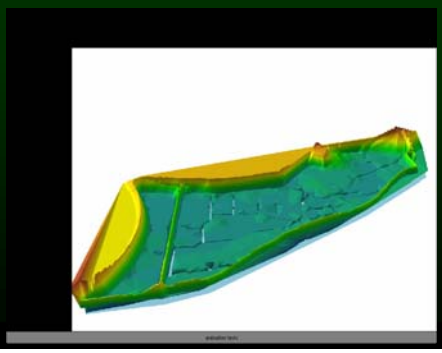
Approach – Physical

- Used existing DEMs and survey data to develop TIN (terrain model) of the study area

Approach – Physical

- Used existing DEMs and survey data to develop TIN (terrain model) of the study area
- TIN used to develop a hypothetical hydrologic model of the study area
- Replicate approach for post-restoration analysis

Approach – Physical



Approach - Physical

- Map substrate composition, “riparian” vegetation, and instream/overhanging cover features through biological sampling corridor
- Incorporate into GIS analysis

Approach – Fish

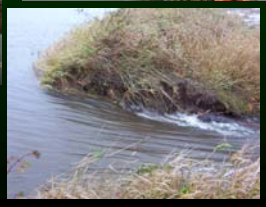
- Systematic hoop net approach
  - 16 sites in study area
  - All but two of these are sampled using end to end double hoop net approach

Approach – Fish

Approach – Fish

- Sampling schedule
  - March 2007
  - May 2007
  - June 2007
  - Fall 2007
  - Winter 2007-2008
  - Spring 2008
  - Summer 2008

Approach – Fish



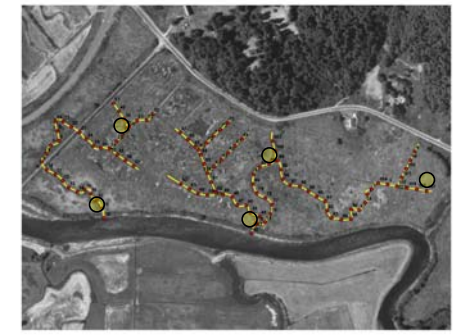
Approach – Fish

Approach – Fish

Approch - Invertebrates

- Benthic
  - 10 cores collected at each of the 16 fish sampling sites
- Pelagic
  - Three replicate drift samples collected between each of the 16 fish sampling sites
  - Active sampling
- Terrestrial
  - Invertebrate fallout traps (IFTs)
  - Five replicate samples at five sites throughout the study area

Approach - Invertebrates



Progress To Date

- Physical
  - Preliminary GIS analysis
  - Stage gauges installed
    - Inriver
    - Tidegate
    - Upland

Progress To Date

- Fish
  - Recon trips
    - November and January
  - Sampling
    - March
- Invertebrates
  - Sampling design developed to be implemented in May

Acknowledgements

- Siletz Tribe
- Oregon Coast NWR Complex
  - Roy Lowe and Dave Pitkin
- Sam Lohr
- Joe Skalicky and David Hines
- Justin Cook, Joel Miller, Greg Silver, and Darby Caton
- Jesse (owner of Riverview Lodge)

Hanford Reach National Monument: Instream Flow and Habitat Assessments

Joe Skalicky 4-25-2007

Water Management and Evaluation Team
Columbia River Fisheries Program Office

Hanford Reach National Monument Studies

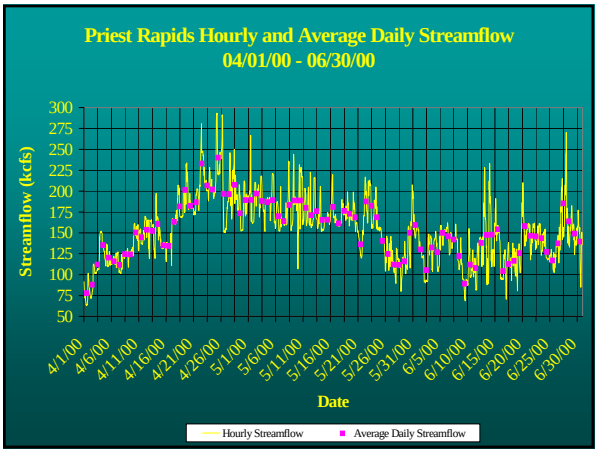
- Goals
  - –Provide instream flow and habitat expertise to support Service goals for fishery and aquatic resource management.
  - –Develop quantitative assessment tools to evaluate impacts of hydrosystem configuration and operation on fishery and aquatic resources.
  - –Work through regional forums to secure streamflows for spawning and rearing fall chinook, as well as other aquatic resources.
  - –Support the Service position regarding FERC relicensing of the Priest Rapids/Wanapum hydro project with the results from our quantitative assessments.

Hanford Reach National Monument Studies

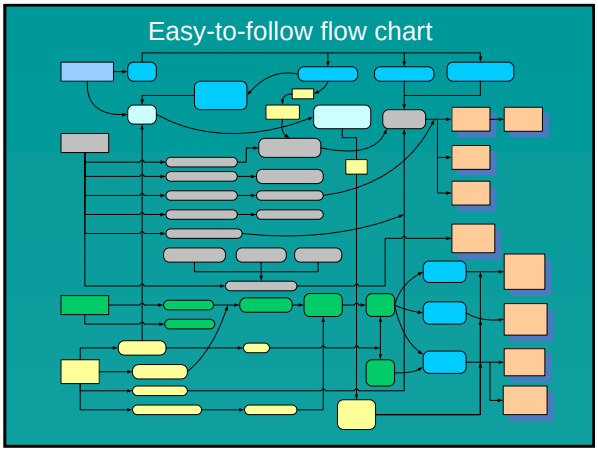
- Objectives
  - –Develop a high-res digital elevation model (DEM) for the entire 90 km (55 miles) Hanford Reach river corridor.
  - –Build a hydrodynamic model and simulate streamflows.
  - –Develop/Assimilate biological habitat criteria for relevant components of the aquatic ecosystem, specifically fall Chinook.
  - –Integrate the biological criteria with hydraulic model output to determine habitat conditions associated with a range of streamflows or hydrosystem operations.

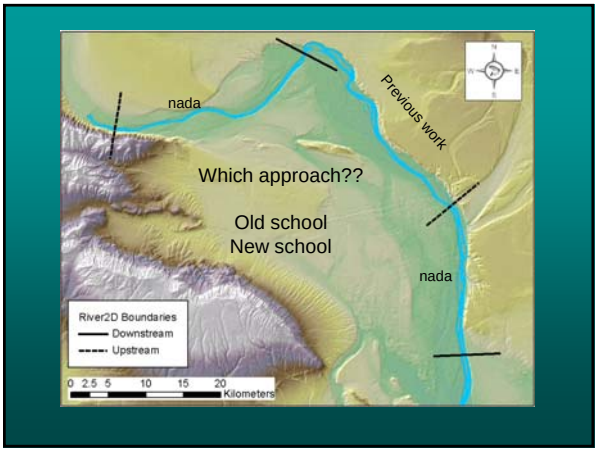
Hanford Reach National Monument Studies

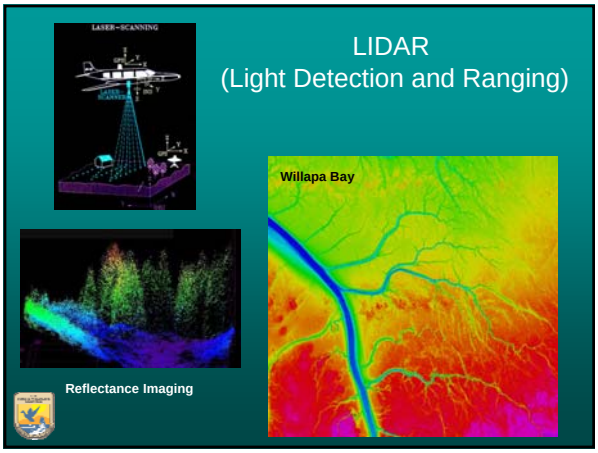
- Assess spawning and rearing habitat across a range of streamflows and flow fluctuations (load following).
- Results of these assessments were used to craft USFWS & DOI Terms and Conditions for the relicensing of the Grant County projects.
- FY07 WDOE funded additional year of standing / entrapment studies (401 cert.) ~$250k

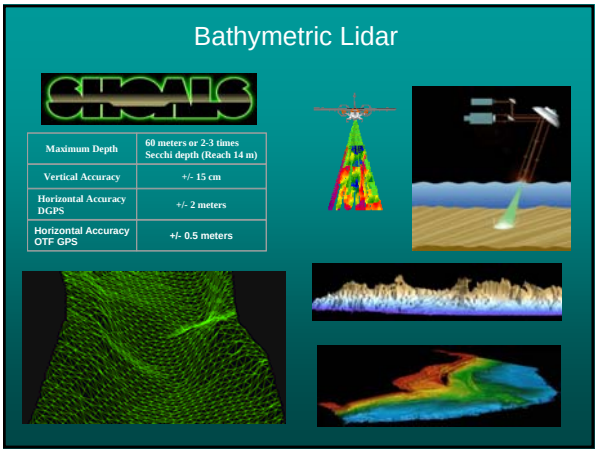


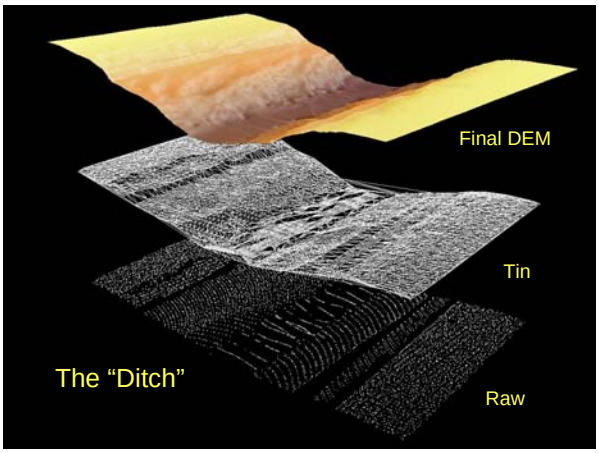

True Stranding
Entrapment
Spawning Habitat
Rearing Habitat


Easy-to-follow flow chart

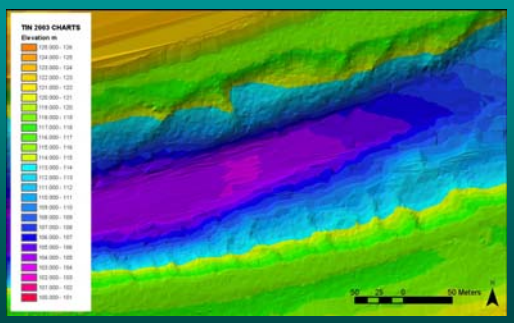

nada
Previous work
Which approach??
Old school
New school
nada
River2D Boundaries
Downstream
Upstream
0 2.5 5 10 15 20
Kilometers

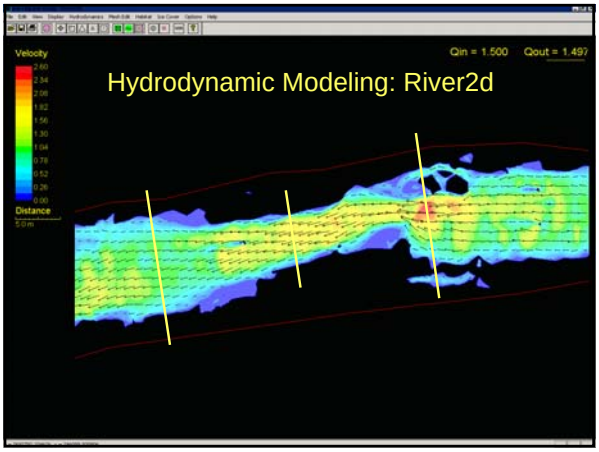

LIDAR
(Light Detection and Ranging)
Willapa Bay
Reflectance Imaging


Bathymetric Lidar
SHOALS
Maximum Depth
60 meters or 2-3 times Secchi depth (Reach 14 m)
Vertical Accuracy
+/- 15 cm
Horizontal Accuracy DGPS
+/- 2 meters
Horizontal Accuracy OTF GPS
+/- 0.5 meters

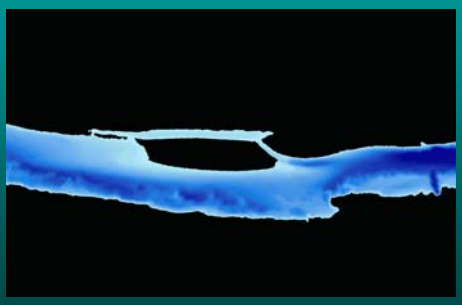


The “Ditch” = Model Foundation

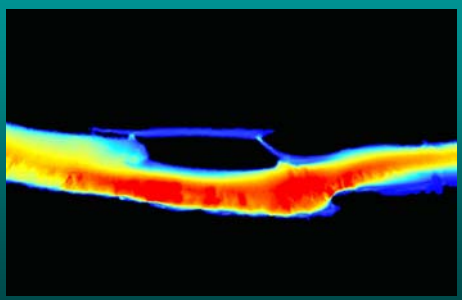




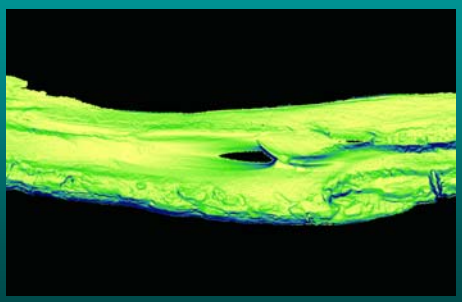
Physical Metrics: Depth

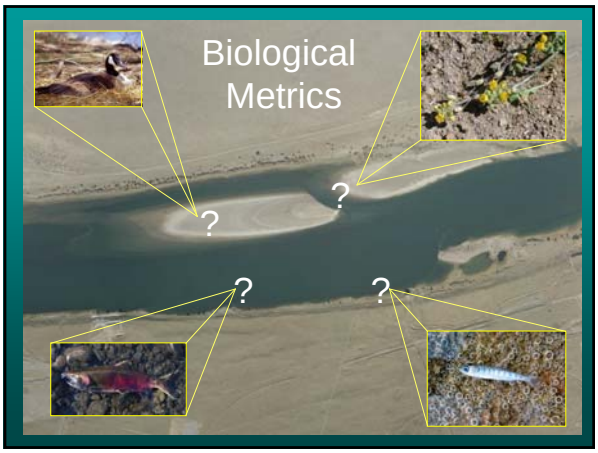


Physical Metrics: Velocity



Physical Metrics: Slope



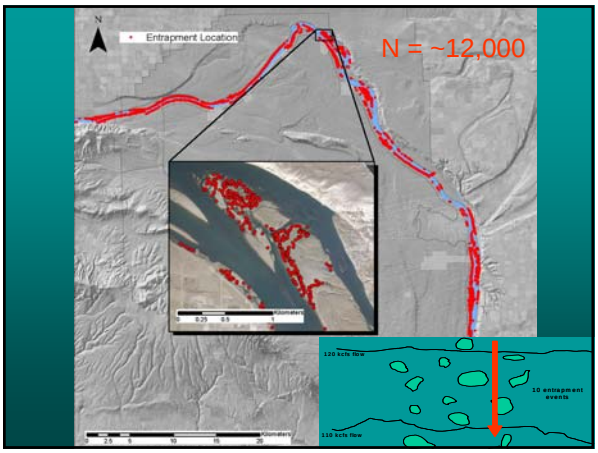


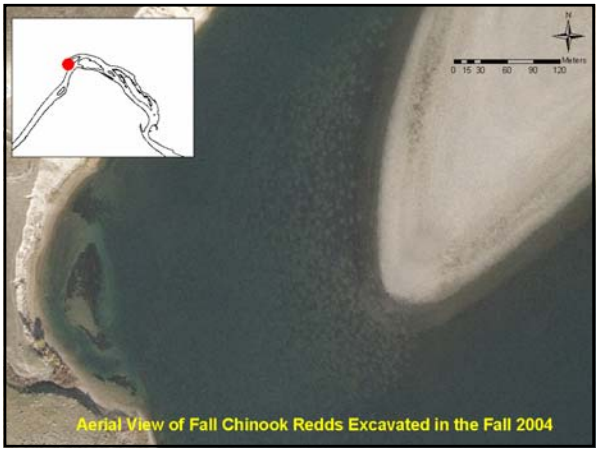
Substrate Measurements: Dry

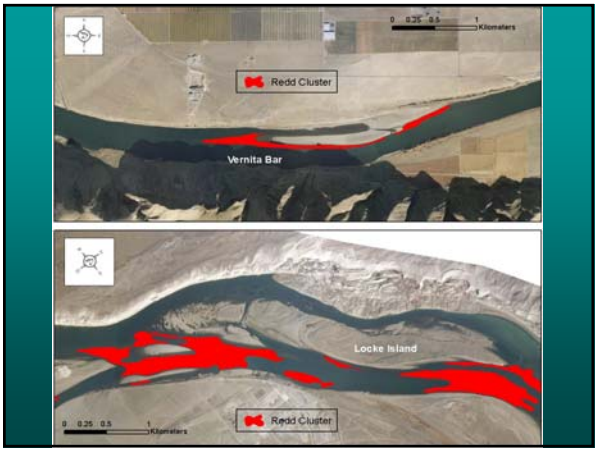
Physical Metrics: Substrate

Entrapment Enumeration Techniques

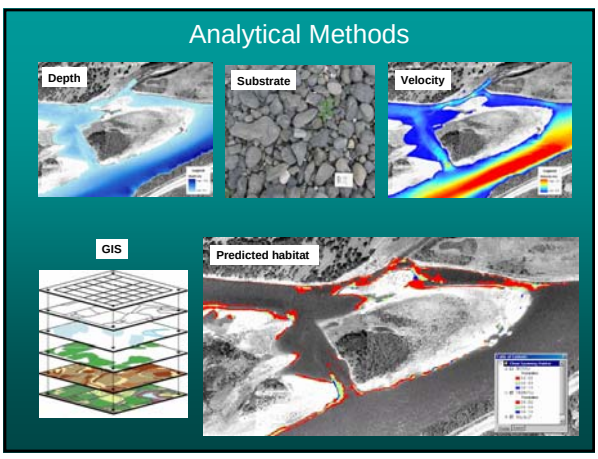
Global Positioning System (GPS)

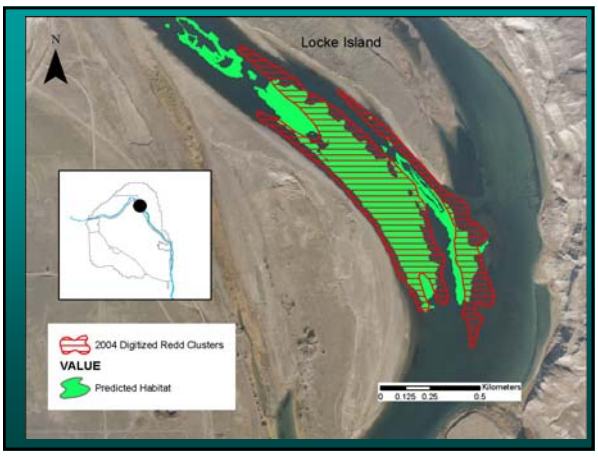






Analytical Methods





Potential Assessments

- Dike removal
- Dam removal
- Irrigation withdrawals
- Drawdown assessment
- Habitat restoration
- Flooding
- Exotics

Assessment of Habitat Restoration at Bandon Marsh NWR

Opportunity to Demonstrate Aspects of FWS Strategic Vision and Direction

- Focuses on conservation priorities common among FWS programs and develops metrics to evaluate effectiveness of restoration projects (Shaping Our Future 2006)
- Directly contributes to components of Strategic Habitat Conservation approach--planning, design, and monitoring (SHC Final Report 2006)
- Encourages internal and external partnerships, may contribute to preventing listings, enhance fishery conservation at NWRs (R1 Fisheries Strategic Plan 2004)
- Develops systematic habitat monitoring, contributes to adaptive management, involves partners in addressing management-oriented information needs (Fulfilling the Promise 1999)

Importance of Monitoring and Assessment for Habitat Restoration Projects

- Contributes to understanding complex systems
- Essential for documenting project performance
- Provides information to evaluate and adapt projects and program approaches

Importance of Monitoring and Evaluation of Habitat Restoration Projects

- Lack of well-designed and funded monitoring and evaluation programs are common hindrance for restoration projects world-wide (Roni et al. 2005)
- Draft national policy notes the role of monitoring to evaluate projects and incorporation of new information into ocean and coastal management (CEQ JSOST 2006)
- Scientifically-based monitoring and success criteria are essential to improve restoration of estuaries (Principles for restoration developed by Restore America's Estuaries and Estuarine Research Federation)
- Estuary Restoration Act of 2000 provided development of protocols for monitoring and evaluation required for all projects funded through the Act

Goal of Assessing Bandon Marsh Habitat Restoration Project

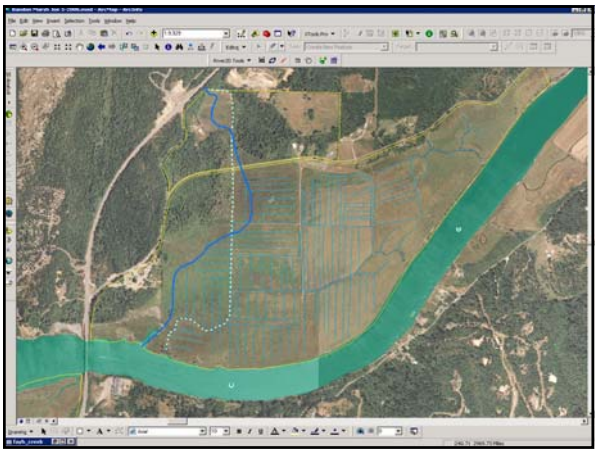
- Determine how the levee removal project at Bandon Marsh NWR changes physical and biological characteristics of the site, and evaluate how changes affect the aquatic community, specifically for fish and other components of the ecosystem.
  - Opportunity to focus on three select areas
  - Restoration actions may vary by area
  - Evaluating all areas potentially increases diversity of habitats addressed and applicability of results to other estuaries
  - Opportunity to focus on select area if necessary due to logistical or funding limits

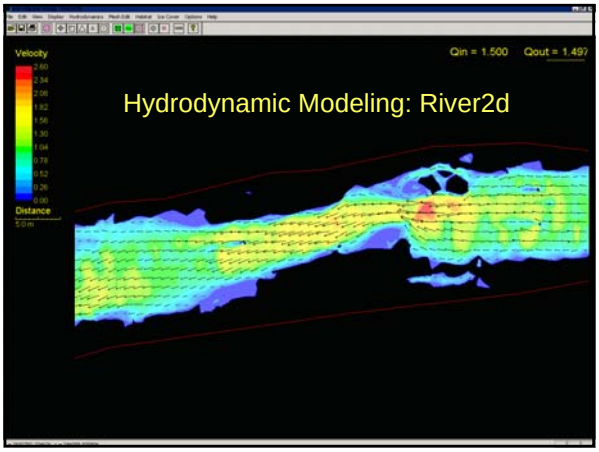
Conceptual Monitoring and Assessment Approach for Bandon Marsh Restoration

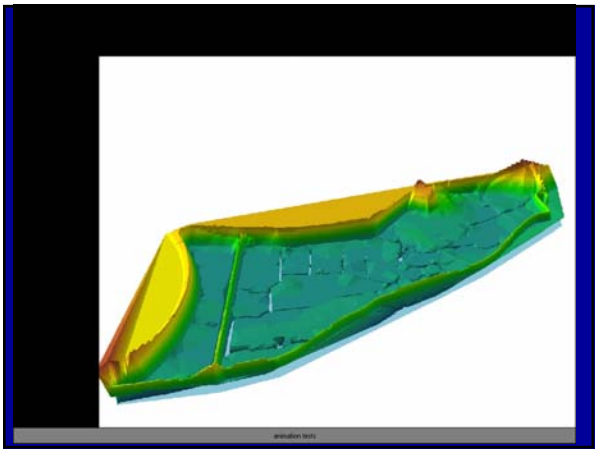
- Apply a before-after control-impact approach
- Compare physical and biological variables within framework of three categories of metrics
  - Habitat capacity (e.g., food resources, preferred habitat, fish refugia)
  - Habitat opportunity (e.g., lack of barriers to fish movement or impediments to accessing resources)
  - Realized function (e.g., residence time, growth, survival rate)

Objective 1: Characterize physiochemical conditions across a range of tidal cycles and seasonally

- Potential variables: wetted area, volume, depth, substrate, vegetation, temperature, salinity, tidal influence, temporal variability
- Comparisons: among restoration and reference sites before and after construction, evaluate relative to habitat capacity and opportunity
- Potential tools: hydrologic and habitat modeling to simulate changes in habitat





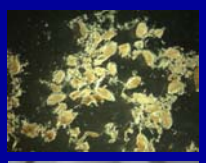


Objective 2: Characterize fish assemblages across a range of tidal cycles and seasonally

- Potential variables: species composition, distribution, abundance/density estimates
- Comparisons: among restoration and reference sites before and after construction, evaluate relative to habitat opportunity
- Potential tools: indices of assemblage structure, introduced species, habitat associations

Objective 3: Characterize performance attributes of fish seasonally

- Potential variables: residence time, diet composition, growth
- Comparisons: among restoration and reference sites before and after construction, evaluate relative to realized function
- Potential tools: indices of diet composition and overlap, condition factor, growth rates



Objective 4: Characterize invertebrate assemblage

- Potential variables: taxonomic composition, distribution, abundance/density estimates
- Comparisons: among restoration and reference sites before and after construction, evaluate relative to habitat capacity
- Potential tools: indices of assemblage composition and overlap, caloric estimates

Latest developments: CPR FY07 funds from Refuges for Fahy Creek pre-restoration assessment by Siletz Tribe and CRFPO

- Quantify physical characteristics of aquatic habitats
- Describe fish species use
- Collect invertebrates and archive for later analyses
- Collect fish stomach contents from native and introduced species to describe diet
- Develop GIS model for physical habitat

Julia Butler Hansen National Wildlife Refuge: Assessment of Fishes, Habitats, and Tidegates in Sloughs on the Mainland

Study goal: Evaluate the overall effectiveness of JBHNWR slough habitat restoration

- Pre and post restoration evaluation
- Reference and treatment study areas

Assessment of Salmonid Populations and Habitat on Tenasillahe and Welch Islands

- **Tidegates planned for retrofit within Julia Butler Hanson NWR**
- **Other habitat modifications include slough-river reconnection, riparian plantings**
- **Benefit for fish?**

Opportunity

and

Habitat Quality

Can fish get in?

Are fish happy that get in?

JBHNWR: Assessment of Fishes, Habitats, and Tidegates in Sloughs on the Mainland

Objective 1: Determine whether adult anadromous salmonids are present in the upper reaches of tributaries before and after modifications are made to tidegates or other restoration activities associated with the lower reaches of tributaries.

Objective 2: Directly assess passage and passage rates of adult anadromous salmonids at the Brooks Slough tidegates. (Planning tasks to be conducted in FY07, implementation tasks to be conducted in FY08)

Objective 3: Assess the periods, frequency, and duration that tidegates (as presently configured, after modifications, and newly installed) are likely conducive to passage by juvenile and adult salmonids, specifically during October-June.

Objective 4: Describe presence, distribution, and biological characteristics (e.g., species, size) of fish inhabiting mainland sloughs and compare to that observed at reference sloughs.

Objective 5: Characterize habitats at mainland sloughs and compare to that observed at reference sloughs.

Objective 1: Determine whether adult anadromous salmonids are present in the upper reaches of tributaries before and after modifications are made to tidegates or other restoration activities associated with the lower reaches of tributaries.

Task 1.1: Conduct surveys for adult anadromous salmonids and evidence of spawning in the upper reaches of the tributaries.

Chum and Coho present in Nelson

No evidence in Risk Creek

Task 1.2: Conduct qualitative survey of habitat in upper reaches of tributaries.

Objective 2: Directly assess passage and passage rates of adult anadromous salmonids at the Brooks Slough tidegates. (Planning tasks to be conducted in FY07, **implementation tasks to be conducted in FY08**)

Task 2.1: Prepare and submit applications for all permits necessary to conduct the adult assessment in fall 2007.

Task 2.2: Conduct design and logistical planning for installation of a PIT tag array at the Brooks Slough tidegate site in fall 2007.

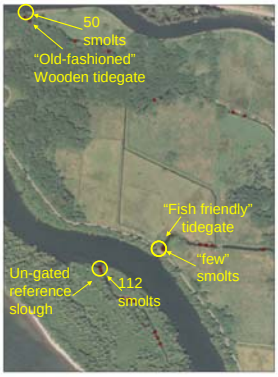
Objective 3: Assess the periods, frequency, and duration that tidegates are likely conducive to fish passage.

Task 3.1: Obtain information generated by the USACOE hydraulic feasibility study.

Task 3.2: Determine periods, frequency, and duration that the existing tidegates are likely open.

Task 3.3: Conduct periodic observations of the tidegates during various periods during the tidal cycle.

Task 3.4: Operate traps for juvenile salmonids on tidegates to determine entry into sloughs.



"Opportunity"=rate of passage

Measure fish ability to pass tidegates relative to un-gated reference sloughs

- Fish presence outside sloughs (tidegates)
- Rate of fish movement into sloughs

Objective 4: Describe presence, distribution, and biological characteristics (e.g., species, size) of fish inhabiting mainland sloughs and compare to that observed at reference sloughs.

Task 4.1: Identify appropriate reference sloughs.

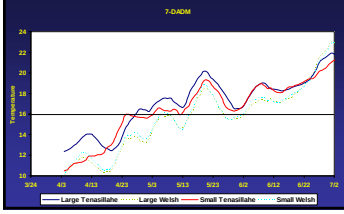
Task 4.2: Identify fish sampling units on the mainland portion (treatment) and on Hunting Islands (reference).

Task 4.3: Conduct survey of fish at select sampling units and record biological characteristics of fish collected.

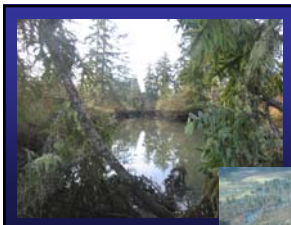
Objective 5: Characterize habitats at mainland sloughs and compare to that observed at reference sloughs.

Task 5.1: Describe water quality characteristics in the sloughs. -Temp/DO loggers

Task 5.2: Describe physical characteristics in the sloughs.



- Two reference sloughs
- 38 sample reaches (minimum 3)
- Lower-most reach included
- Random selected
- Habitat (width, profile, etc)
- Fish community (seine)
- Temp and DO loggers



Accomplishments

- Selection of reference sloughs and sample reaches
- Fall 2006 spawning ground survey (chum and coho in Nelson)
- Midway through fish community and habitat work
- Conducted “early” opportunity trials in gated and reference sloughs

Future

- Finish 2007 pre-construction evaluation
- 2008 – second year pre-construction evaluation (incorporating 2007 experience)
- 2009-2010 Post-construction evaluation
- Final report

CRFPO Fisheries Assistance for National Wildlife Refuges




Categories of NWR Immediate Needs

- Support for CCP Development, including step-down plans (19)
- General Technical Assistance (14)
- General Survey and Assessment (6)
- Refuge or Issue Specific (7)
- Outside of CRFPO Purview (4)

Support for CCPs

- Participation on extended planning teams (Julia Butler Hansen, Lewis and Clark, and Ridgefield NWRs)
  - Assistance with existing information and background, developing goals and objectives, alternatives
- Oregon Coast Complex initiated preplanning for marine NWRs in 2006, estuary NWRs to follow
- Sheldon NWR initiated planning, biological review planned for summer 2007

General Technical Assistance


- Review information for Tualatin NWR about potential flow changes due to dam modification
- Discussions with R1 Engineering concerning life history and instream flow study for redband trout at Malheur NWR
- Assist Gee Creek Watershed Coordinator at Ridgefield NWR

Survey component for Gee Creek assistance-involve volunteers in investigating fish species present in lower reaches on NWR during spring 2007



General Survey and Assessment

- Provide equipment, fish identification, and collection permits for sampling fish in seasonal wetlands at Tualatin NWR
- Survey for fish species composition in wetlands at Steigerwald Lake NWR
- Assessment of fish species, habitat, and invertebrates in Nelson Creek adjacent to Julia Butler Hansen NWR


Nelson Creek study reaches

Habitats among Nelson Creek study reaches

Fish species observed

Species	Middle Nelson	Lower Nelson	Indian Jack Slough
Coho	95	7	
Cutthroat	24	1	
Rainbow	3		
Trout	2		
Sculpin	numerous	43	
WB lamprey	5		
Pikeminnow		19	
Stickleback			1

Nelson Creek: Preliminary conclusions

- Fish passage exists in lower reach
- Spawning in middle reach
- Middle reach habitat with high fine substrate and low LWD
- Consider passage in slough and effects of water diversion on lower wetlands
- Complete invertebrate analysis

Watershed demonstration project

- Intent: To identify opportunities for focused restoration efforts in watersheds with NWRs
- Previous workshop: Tualatin River, Gee and Gibbons creeks suggested as candidates; use activities at Nisqually NWR as a model
- Learned: High level of restoration work results from Nisqually River Council, long history and watershed management plan guiding short- and long-term goals, Nisqually Tribe often leads efforts, large federal landownership in basin
- Other watersheds associated with NWRs should be considered candidates

Watershed characteristics

Biological/Physical

- Watershed and stream size
- Historic conditions
- Present conditions
- Feasibility of restoring or mimicking conditions
- Future threats
- Ability for fish access
- Listed, proposed, trust, or special status species

Administrative/Situational

- Watershed plan/assessment
- Watershed council
- Land ownership
- Support by landowners
- Allocation of water supply
- Recovery plan or agreement
- Educational opportunities
- Potential for leadership and support