Successes and Disappointments in Fish Passage at FERC Projects in New England

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U.S. Fish and Wildlife Service
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Upstream Passage

Fish Passage at Projects Not Reviewed in FERC Evaluation of Mitigation Effectiveness

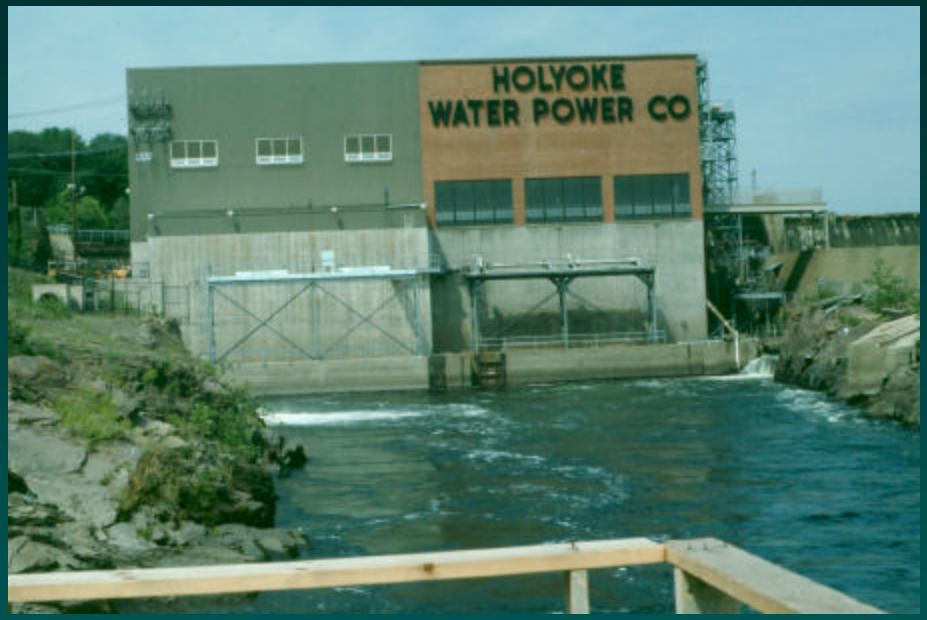
(NH,VT,MA,CT)

Upstream Passage

P-2004- Holyoke	**Connecticut***
P-1889- Turners Falls	**Connecticut***
P-1904- Vernon	Connecticut
P-1855- Bellows Falls	Connecticut
P- 1892- Wilder	Connecticut
P-2800- Lawrence	**Merrimack***
P-2790- Lowell	**Merrimack***
P-1893- Amoskeag	Merrimack
P- 6985- Kinneytown	Naugatuck
P- 7590- Jackson Mills	Nashua
P- 3442- Mine Falls	Nashua
P- 4718- Cocheco Falls	Cocheco
P- 2756- Chase Mill	Winooski

*American shad evaluations

Holyoke Project



Turners Falls Project – Cabot Station

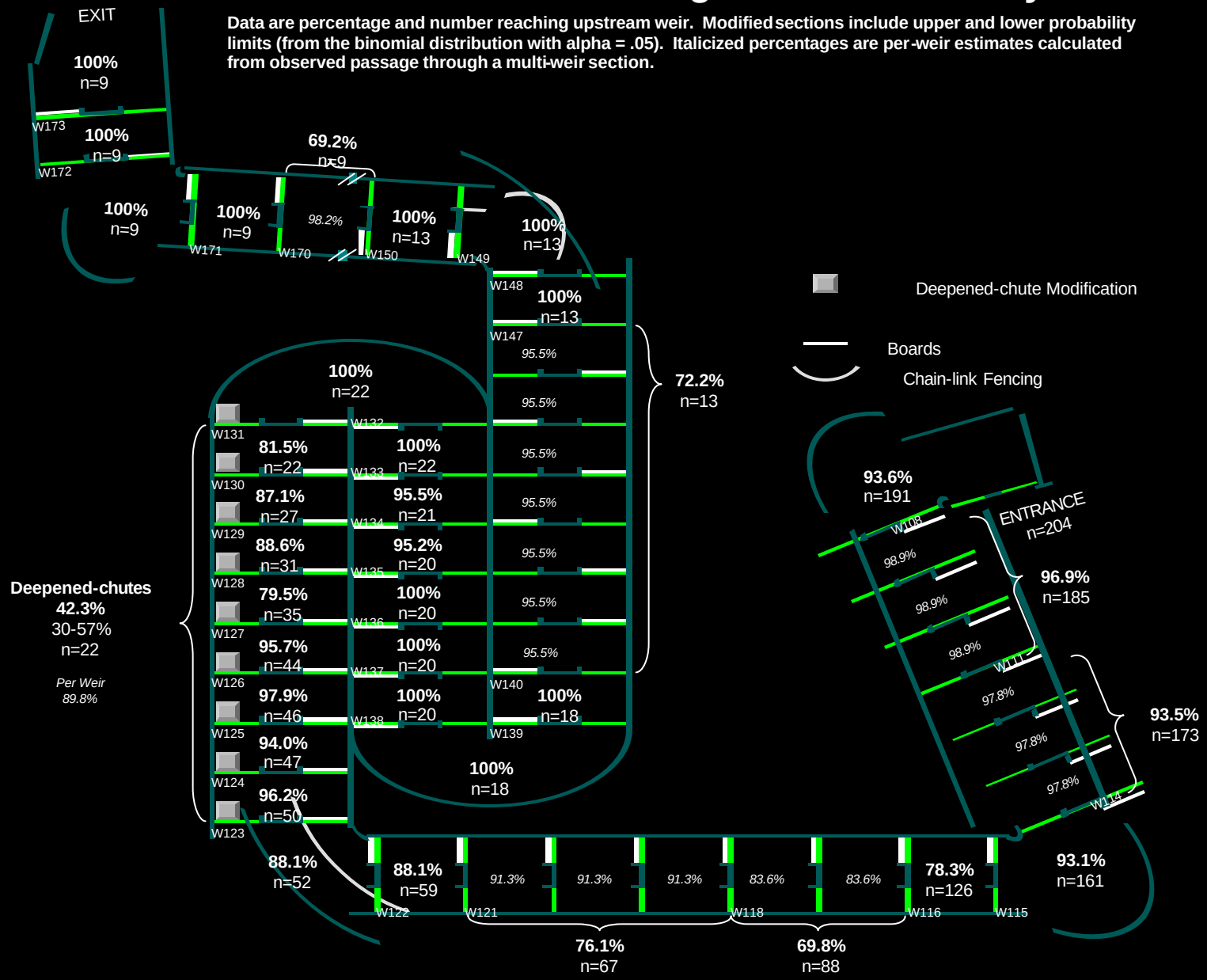
Vernon Project

Shad Upstream Passage - Connecticut River

Project	Type	Year	Shad Count	% Downstream Count	Restoration Goal
Holyoke	L	2000 2001 2002 2003 Max.	225,000 273,000 376,000 287,000 720,000(1992)	N/A	750,000 to 1 Million
Turners (Cabot)	P/W Ladder	2000 2001 2002 2003 Max.	12,289 20,933 7,922 N/A 94,000(1992)	5.5% 7.7% 2.8% ---- 16.7% (1991)	N/A
Turners (Gatehouse)	VS Ladder	2000 2001 2002 2003 Max.	2,590 1,540 2870 N/A 55,000 (1991)	1.1% 0.6% 0.8% ---- 10.4%(1991)	300,000 to 600,000
Vernon		2000 2001 2002 2003 Max.	1,536 1,666 336 267 37,000(1991)	59% 108% 12% N/A 85.7%(1995)	120,000 to 360,000

2003 Percent Passage – Cabot Fishway

Data are percentage and number reaching upstream weir. Modified sections include upper and lower probability limits (from the binomial distribution with alpha = .05). Italicized percentages are per-weir estimates calculated from observed passage through a multi-weir section.



Shad Upstream Passage - Connecticut River

Project	Type	Year	Shad Count	% Downstream Count	% Effectiveness (Study)	Restoration Goal
Holyoke	L	2000 2001 2002 2003 Max.	225,000 273,000 376,000 287,000 720,000(1992)	N/A	42% - 50% overall	750,000 to 1 Million
Turners (Cabot)	P/W Ladder	2000 2001 2002 2003 Max.	12,289 20,933 7,922 N/A 94,000(1992)	5.5% 7.7% 2.8% ---- 16.7% (1991)	-17% Internal efficiency -34% enter	N/A
Turners (Gatehouse)	VS Ladder	2000 2001 2002 2003 Max.	2,590 1,540 2870 N/A 55,000 (1991)	1.1% 0.6% 0.8% ---- 10.4%(1991)	-85% Internal efficiency -22% enter	300,000 to 600,000
Vernon		2000 2001 2002 2003 Max.	1,536 1,666 336 267 37,000(1991)	59% 108% 12% N/A 85.7%(1995)	None	120,000 to 360,000

Turners Falls Project - Future Evaluations and Changes

CABOT STATION

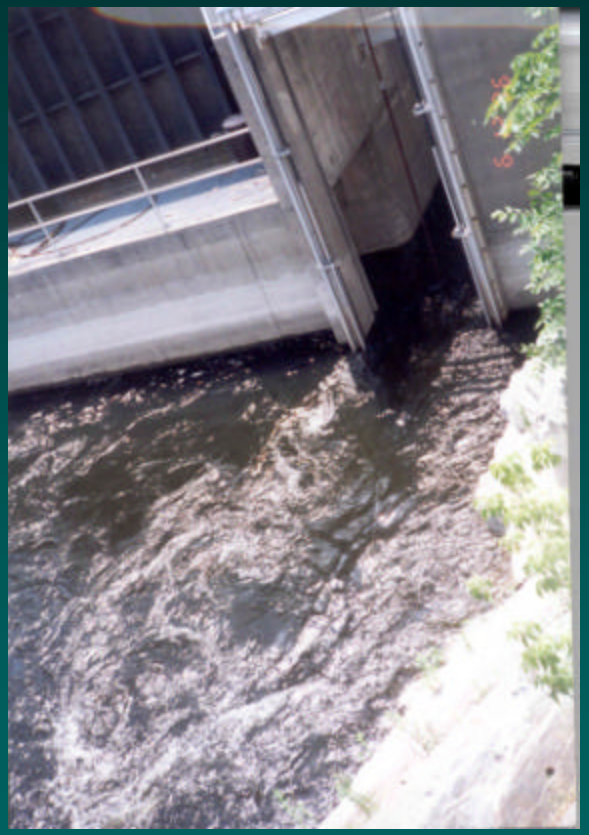
- Re-align ladder weirs and orifices to proper alignment
- Consider scrapping Cabot ladder for lift system
  - Develop initial conceptual drawings
  - Negotiation with project owner

GATEHOUSE

- Evaluate a new gatehouse entrance downstream of high turbulence zone

Lawrence Project

Lowell Project



Amoskeag Development- Merrimack River Project

Shad Upstream Passage Success
Merrimack River Projects

Project	Type	Year	Shad Count	% Downstream Count	% Effectiveness (Study)
Lawrence	Lift	1999 2000 2001 2002 2003	56,461 72,800 76,717* 54,586 55,620	N/A	1993 –30% overall -10% internal 1995 – 20% internal after changes
Lowell	Lift**	1999 2000 2001 2002 2003	15,731* 12,716 7,578 5,283 6,276	28% 17% 10% 10% 11%	1999 – 42% internal 2002 - 11% of fish in tailrace pass
Amoskeag	P/W Ladder	1999 2000 2001 2002 2003	0 0 0 0 10*		

* Historical high

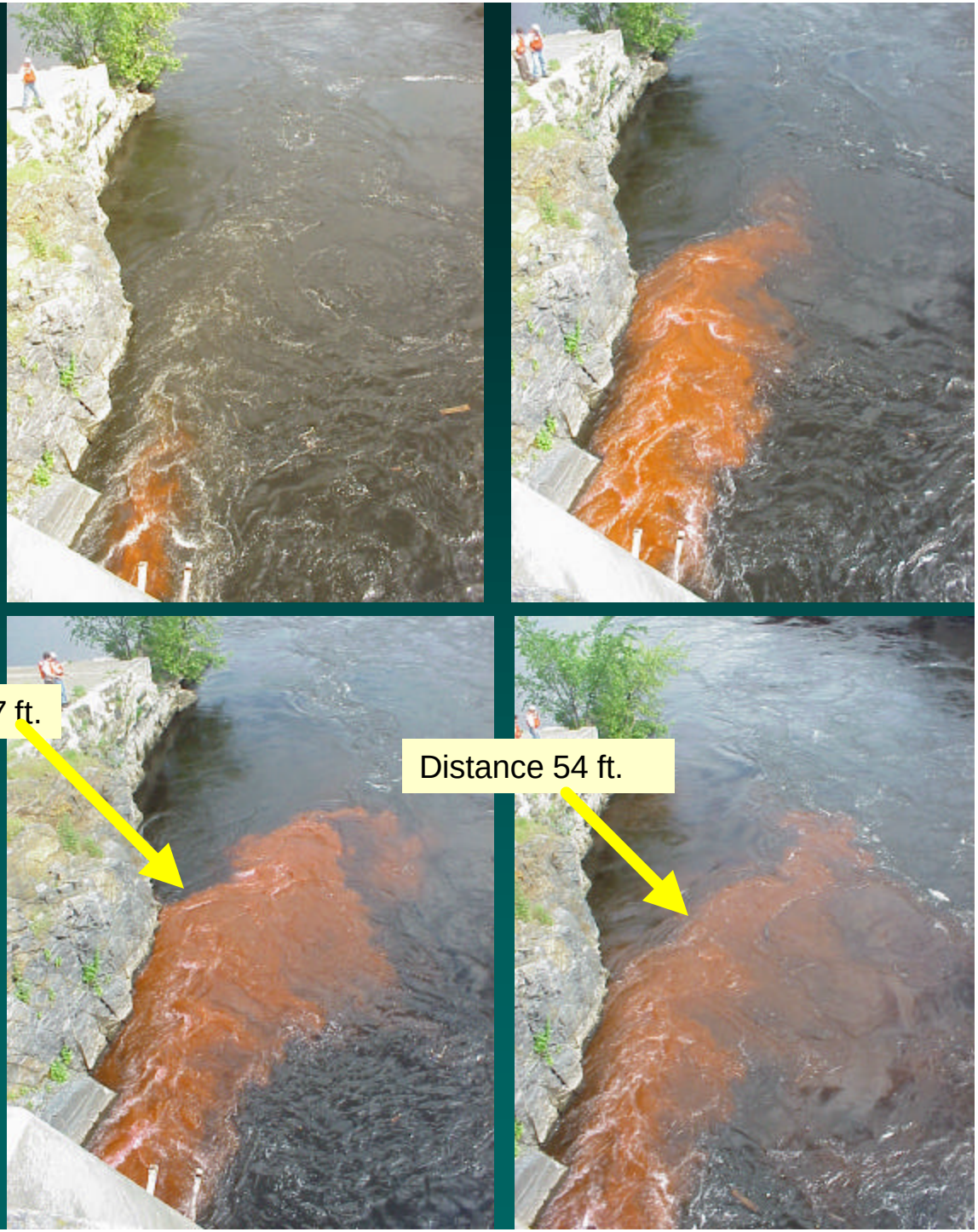
**Vertical Slot Ladder at dam not monitored

Lowell Fish Lift Dye Release 6/16/03

Station running at 77% capacity

Lawrence Project Dye Release Study
6-23-03

Station running at 80% capacity



Lowell Project – Future Evaluations and Changes

- Work with Enel North America (formerly CHI Energy)
- Evaluate alternate entrance – previously closed off
- Evaluate tailrace flow field
- Evaluate unit discharges versus passage
- Further actions
- Involve FERC to arbitrate as needed

Upstream Passage Evaluations

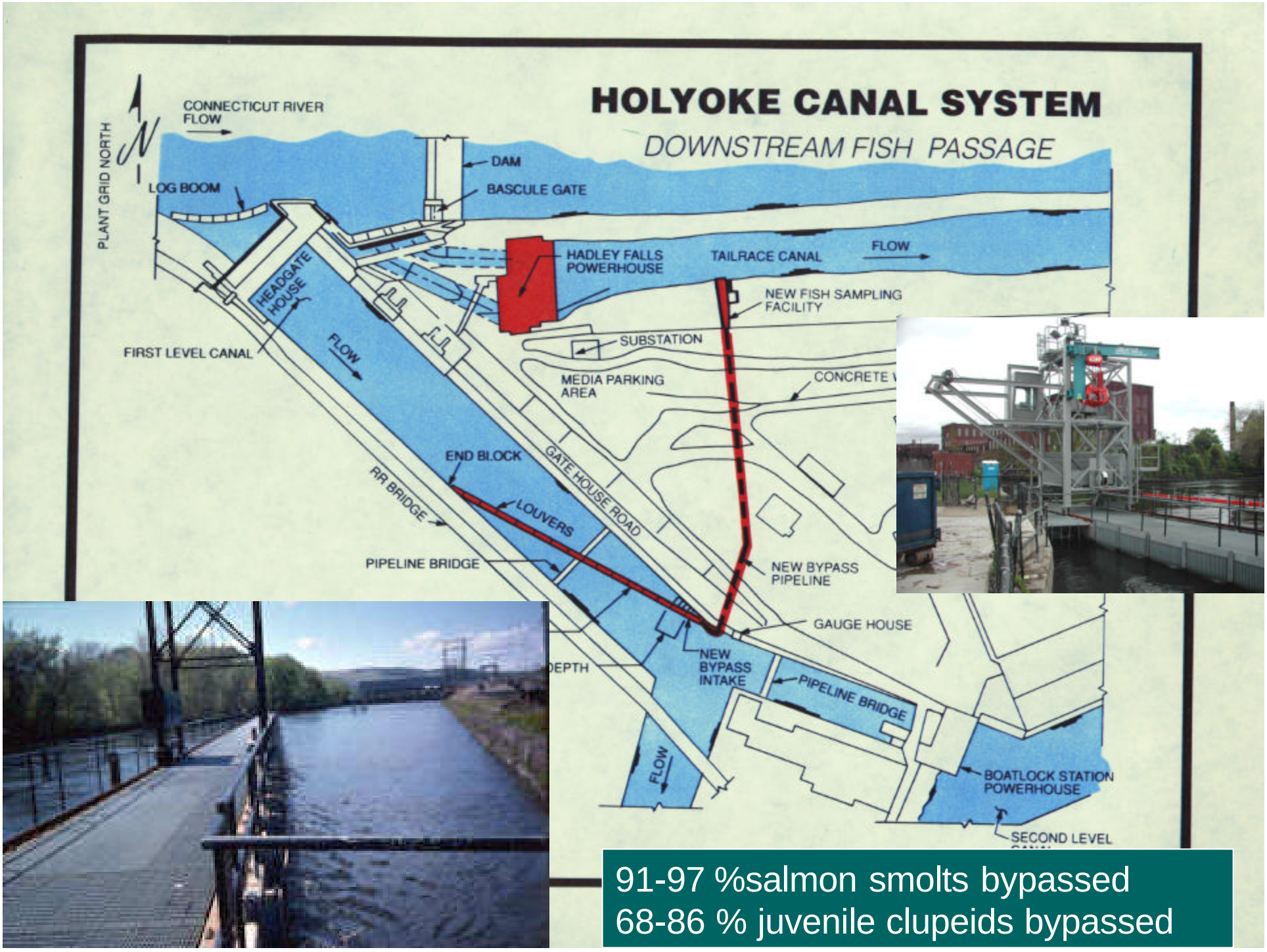
- Upstream passage evaluations have been more common – even if only qualitative
- Evaluations at some level are needed at all projects
- First step should be fish counts and comparison to downstream counts (if available)
- Also can start with qualitative evaluations/observations
- Quantitative (mark and release/radio-telemetry)– Next step if initial evaluations indicate problems

Downstream Passage

Projects Not Reviewed in FERC Evaluation (NH,VT,MA,CT)

Downstream Passage

P-2004- Holyoke	**Connecticut**	P-3131- Brockaway Mills	Williams
P-1889- Turners Falls	**Connecticut**	P-7888- Comtu Falls	Black
P-1904- Vernon	**Connecticut**	P-8014- Slack	Black
P-1855- Bellows Falls	**Connecticut**	**P-9649- Lovejoy**	**Black**
P-1892- Wilder	**Connecticut**	P-9648- Fellows	Black
P-2800- Lawrence	**Merrimack**	P-9650- Gilman	Black
P-2790- Lowell	**Merrimack**	P-2396- Pierce Mills	Passumpsic
P-1893-Amoskeag	**Merrimack**	P-2397- Gage	Passumpsic
P-1893-Hookset	**Merrimack**	P-2399 Arnold Falls	Passumpsic
P-1893- Garvins Falls	**Merrimack**	P-2400- Passumpsic	Passumpsic
P-2457- Eastman	**Pemmigewasset**	**P-3051- East Barnet**	**Passumpsic**
P-6689- Penacook Upper	**Contoocook**	**P-3342- Penacook Lower**	**Contoocook**
P-3240- Rolfe Canal	**Contoocook**	P-10163- Cresticon Upper	Millers
P-10163- Cresticon Lower	Millers	**P-7991- Ashuelot Paper**	**Ashuelot**
P-8235- Lower Roberston	**Ashuelot**	P-11313- Apthorp	Ammonoosuc
P-4609- Ammonoosuc	Ammonoosuc	P-3464- Lisbon	Ammonoosuc
P-5307- Woodsville	Ammonoosuc	P-2077- McIndoes	Connecticut
P-8011- Dodge Falls	Connecticut	P-6096- New Home	Millers
P-3320- Lower Valley	Sugar	**P-9088- Lafayette Street**	**Sugar**
P-5261- Newbury	Wells	P-5379- Hadley Falls	Piscataquog
P-3180- Greggs Falls	Piscataquog	P-3025- Kelly's Falls	Piscataquog
P-3185- Webster-Pembroke	Suncook	P-4337- Hogue-Sprague	Contoocook
P-5735- Hopkinton	Contoocook	P-6116- Hosiery Mills	Contoocook
P-9282- Pine Valley	**Souhegan**	P-2986- Crescent	Westfield



91-97 %salmon smolts bypassed
68-86 % juvenile clupeids bypassed

Wilder Project - Spill Gate

88-96% salmon smolts bypassed

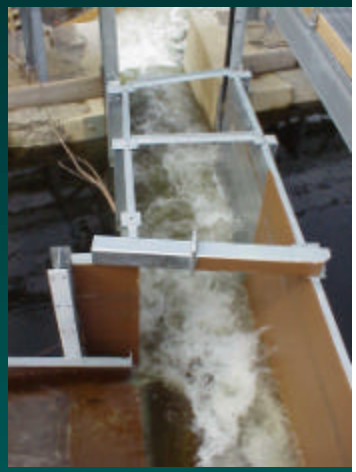
Pine Valley Project – 1-inch Bar Rack/Bypass

- 95% salmon smolts bypassed

Bellows Falls Project– Curtain Wall

94% salmon smolts bypassed

Garvins Falls Development – Merrimack River Project - Louver/Bypass



88% salmon smolts bypassed

Vernon Project- Louver/Fish Pipe/Ice Sluice

74% salmon smolts bypassed

Lowell Project – Bypass

32% salmon smolts bypassed

Rolfe Canal Project – Narrow Screening at Surface/Bypass

Penacook Upper Falls
- Bypass

Penacook Lower Falls
- Bypass

Bypass Efficiencies of 0% to 6.2%

Upper Falls
Flow Inducer

58 %smolts
bypassed

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Downstream Passage

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Why no bypass efficiency testing?

- Post-license or exemption re-openers
- Requirement for passage but not evaluation
- Many designs were negotiated with project owners
- If built like agencies want – no testing was required

Downstream Passage Evaluations

- Many passage successes
- Also a number of disappointing results
- Downstream passage evaluations more difficult – especially with non-salmonids
- Testing often leads to many years of changes and re-evaluation
- All facilities are different – technology transfer not always a sure thing
- Uncertainty remains on effectiveness at some projects
- Effectiveness testing should be undertaken at all licensed or relicensed projects in the future
- Effectiveness evaluations and modifications may take many years and need to be designed without a certain end date to assure that passage facilities are effective in the end