Wood, Water, and Fish: Large Wood Restoration in the Harris River Watershed 2005 to 2011

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USDA Forest Service

Photo by B.Christensen

ACKNOWLEDGEMENTS

IT TAKES A TEAM!

Our Partners
The Nature Conservancy
National Forest Foundation
National Fish and Wildlife Foundation
AK Department of Fish & Game (Habitat & Sport fish)
NOAA Coastal Restoration Program
AK. Department of Transportation

Our Contractors
S&S General Contractors
Southeast Road Builders

USFS
Fish/Water/Silv.
Brian Bair
Brian Barr
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KK Prussian
Aaron Prussian
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Mark Minnillo
Steve McCurdy

Recreation
Maeve Taylor
Ben Walker
Tory Houser
Katie Rook

And numerous other Forest Service Staff

Discussion Topics

- What happened to our Streams
- Stream 101
- Large Woody Debris – what it does, why it's important , why are we concerned and doing something about it.
- Restoration in the Harris Watershed

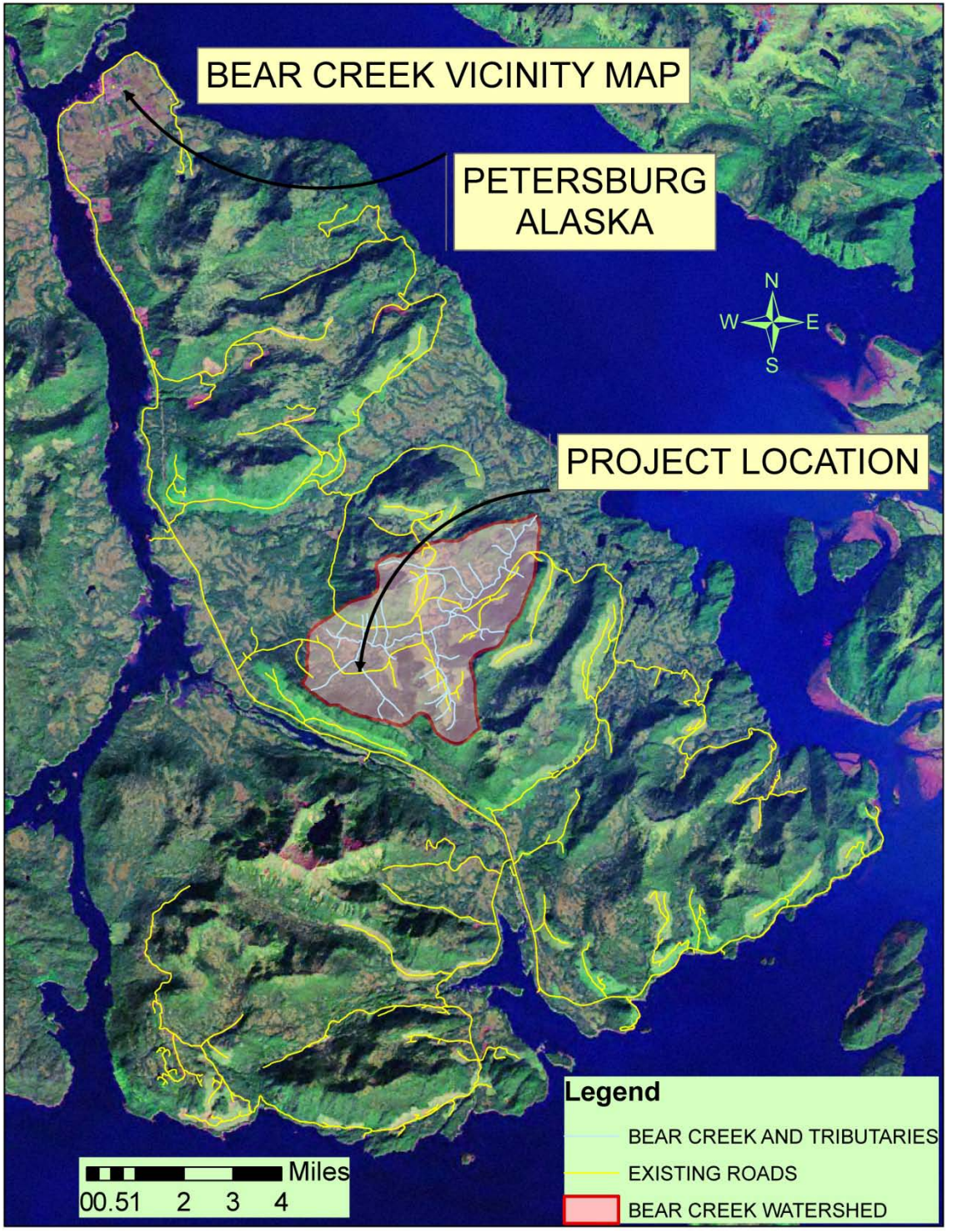
What Happened to Some of Our Salmon Streams

What is the Streams Function within a Watershed?

They process and convey:

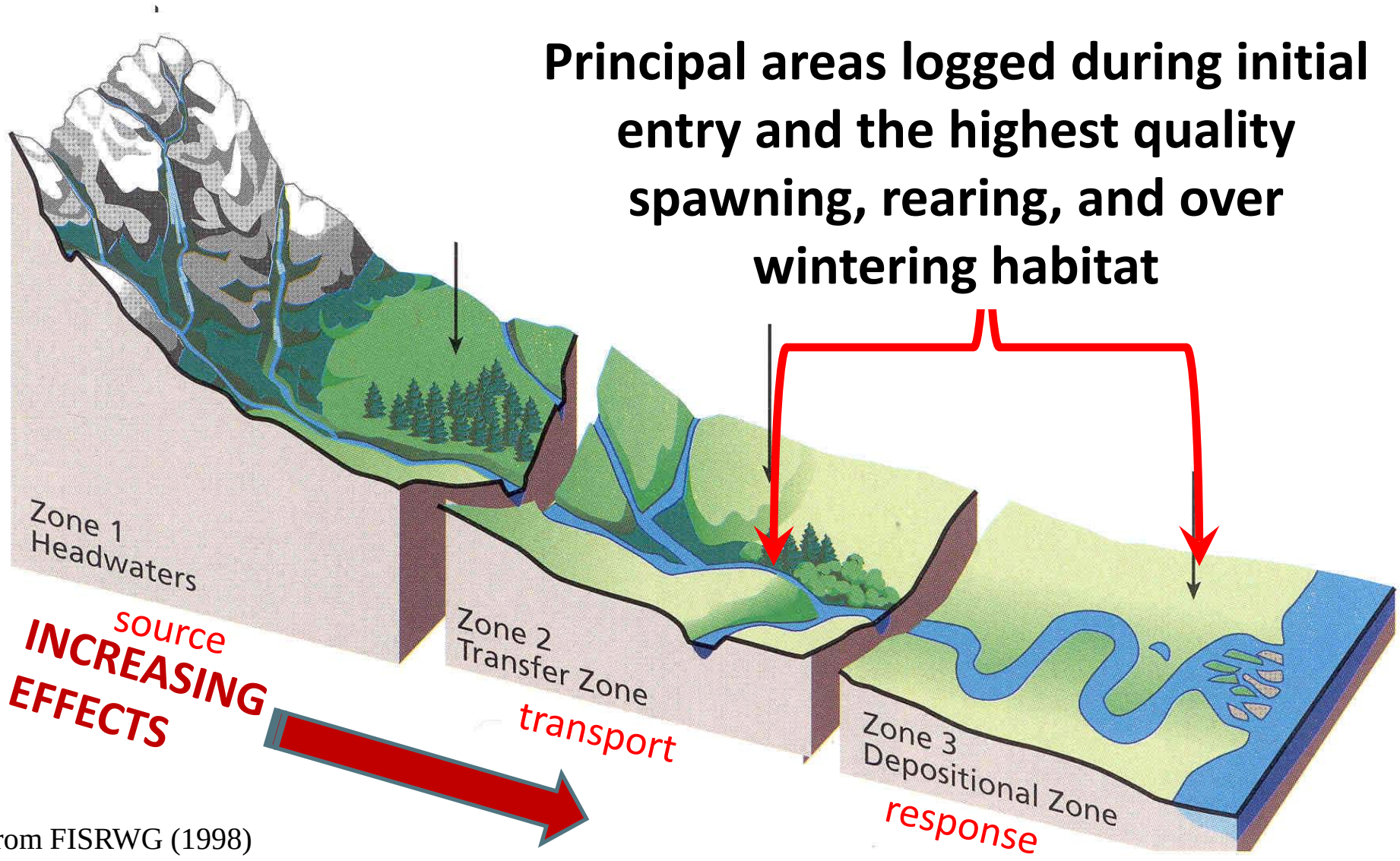
- Water
- Sediment
- Wood

Provide habitat for Biota



Effects Vary depending on Channel Position in Watershed

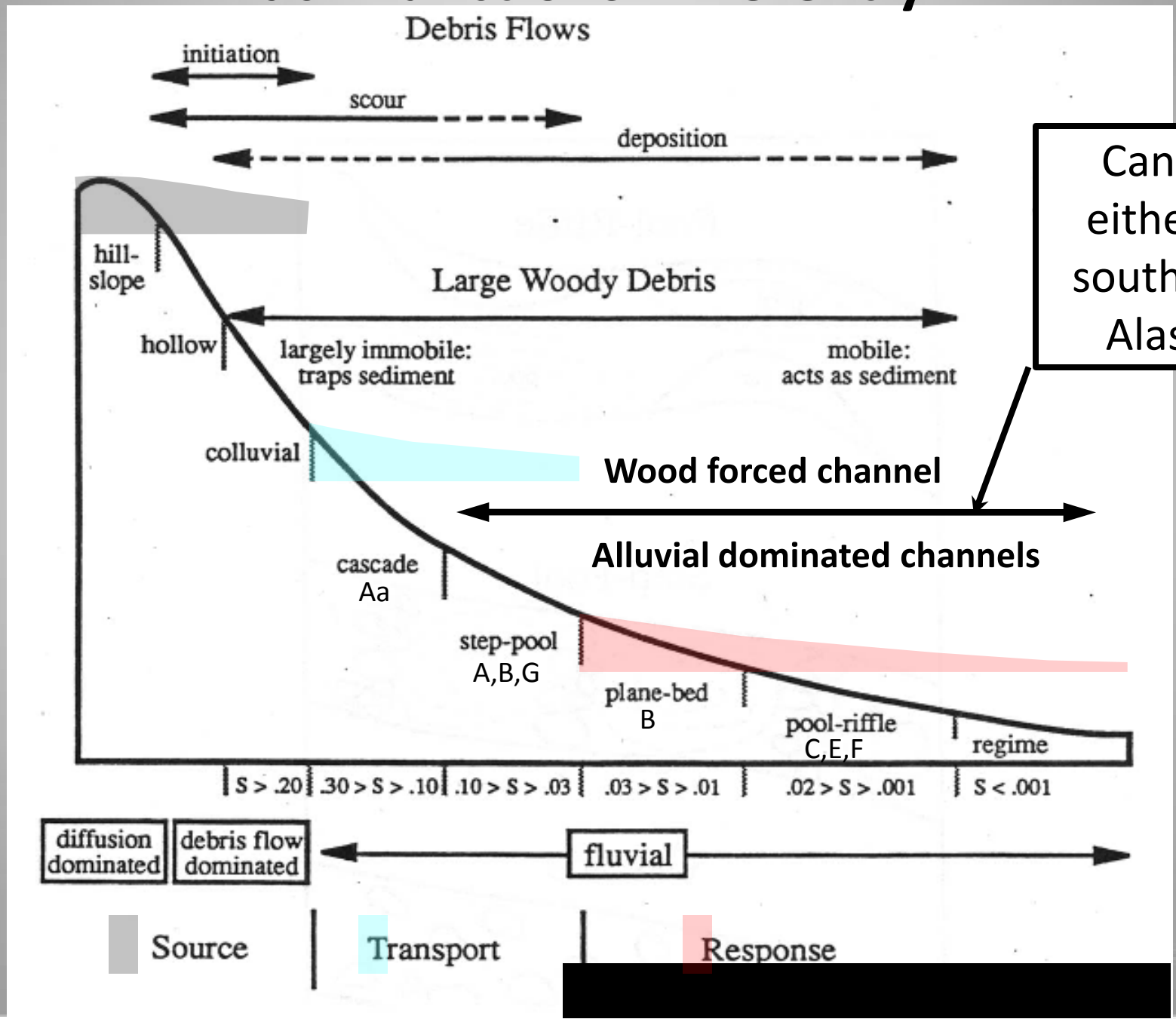
Principal areas logged during initial entry and the highest quality spawning, rearing, and over wintering habitat



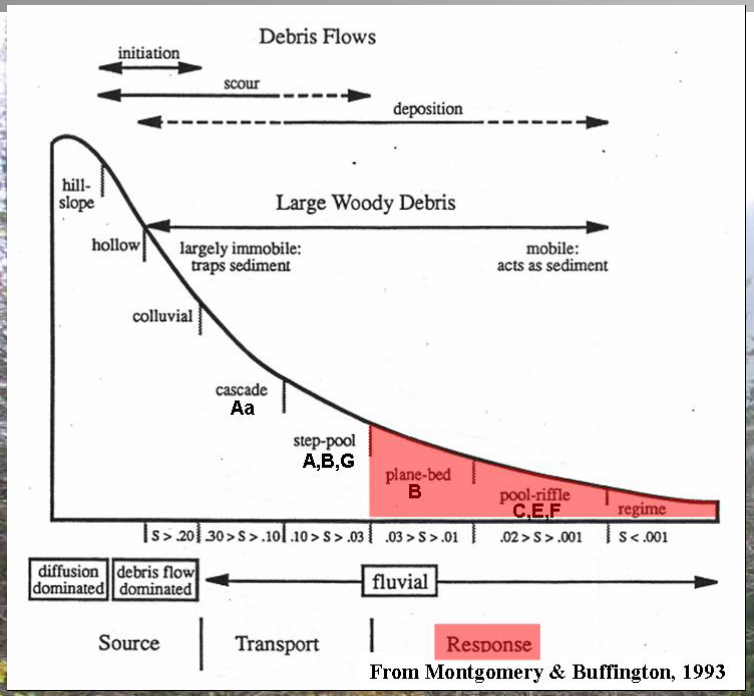
from FISRWG (1998)

Degree of effect is a function of the extent and proximity to the area of interest

Watersheds are Composed with Different Stream Types Each Functions Differently



Can be either in southeast Alaska



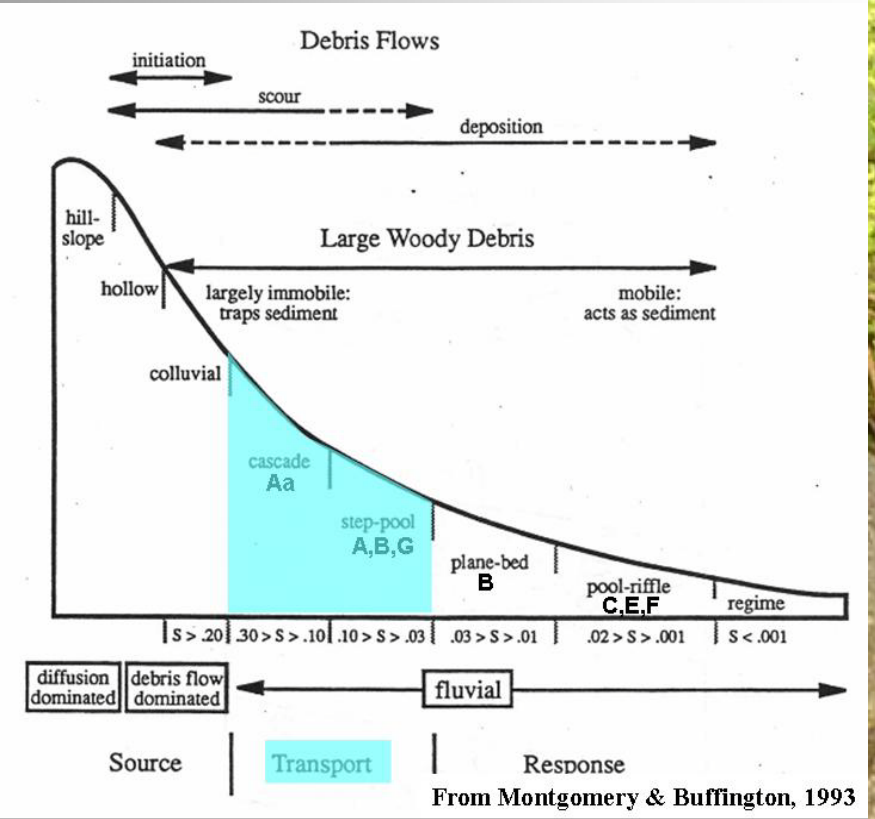
Response Reach, Pool-Riffle (C) channel

More affected by changes in the watershed

Pink and Chum Habitat

Transport Reach
Step-pool (B) channel

Less affected by changes
in the watershed

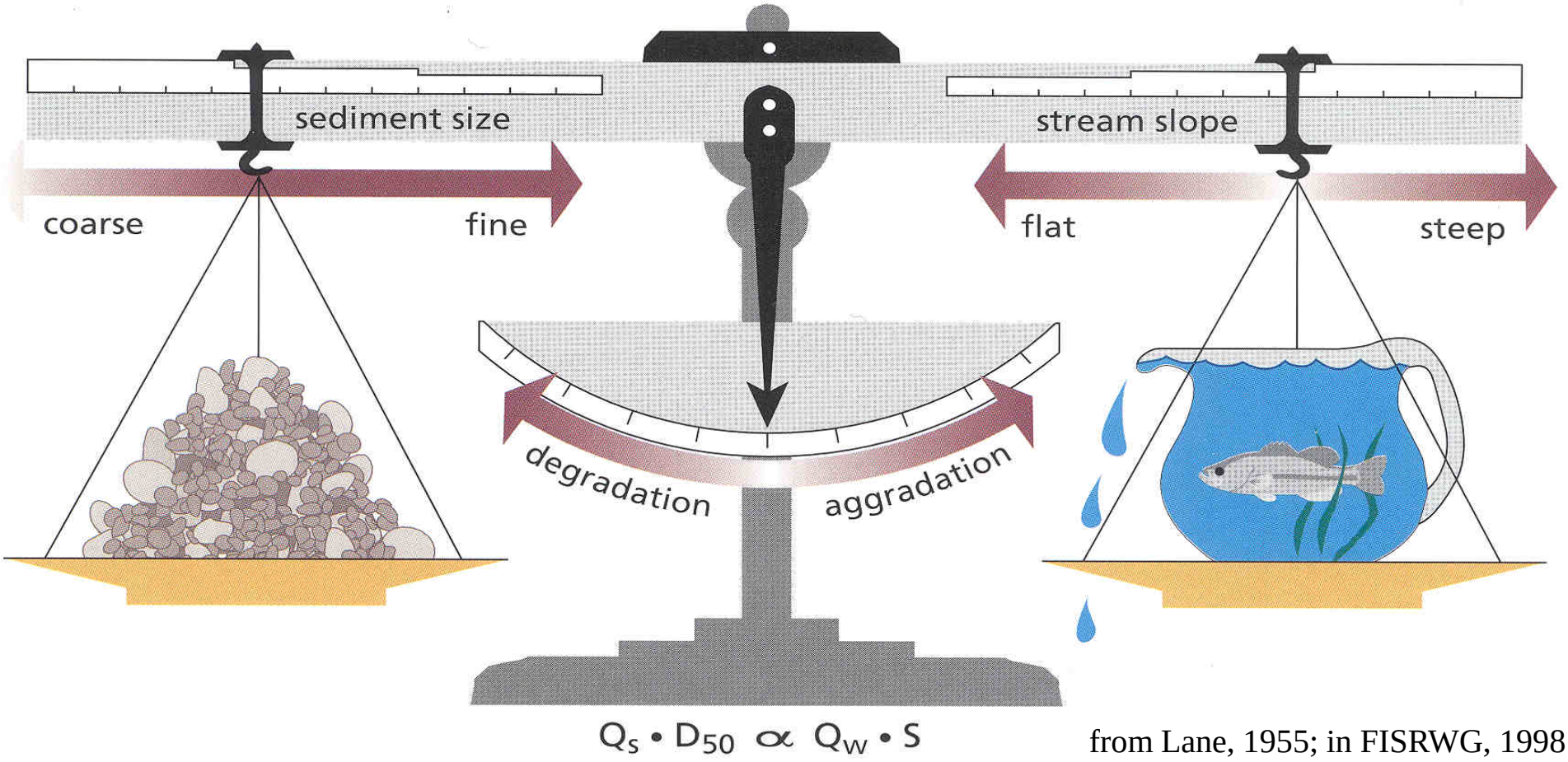


From Montgomery & Buffington, 1993

Channel Adjustments and Responses

Sediment $\propto$ **Stream**

(LOAD) X (SIZE) $\propto$ **(SLOPE) X (DISCHARGE)**

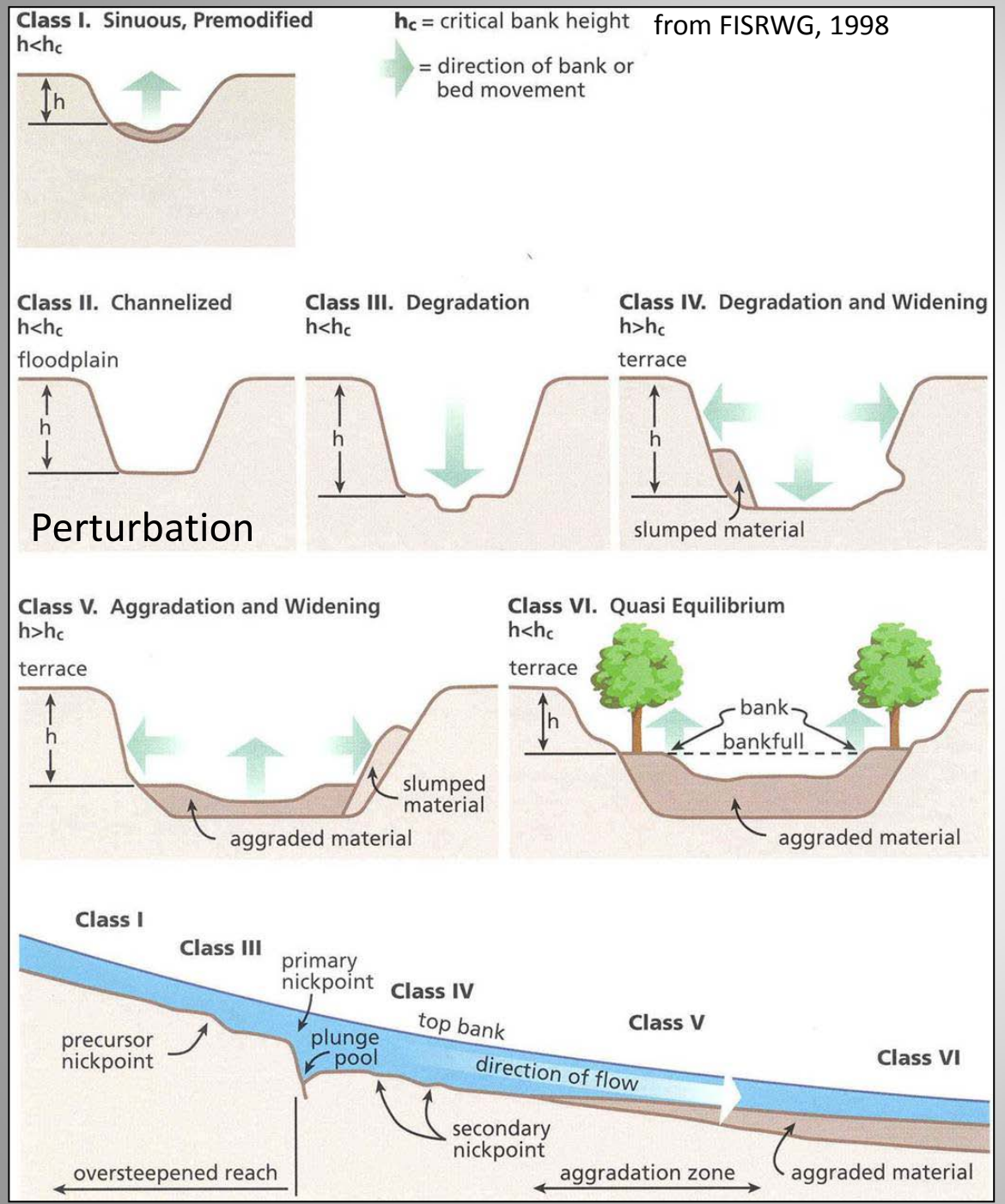


from Lane, 1955; in FISRWG, 1998

CHANGE ONE VARIABLE AND THE REST MUST ADJUST.

Altered LW volume affects sediment routing and storage, changes in sediment load and distribution affect channel dimensions

Channel Evolution: Channel Instability

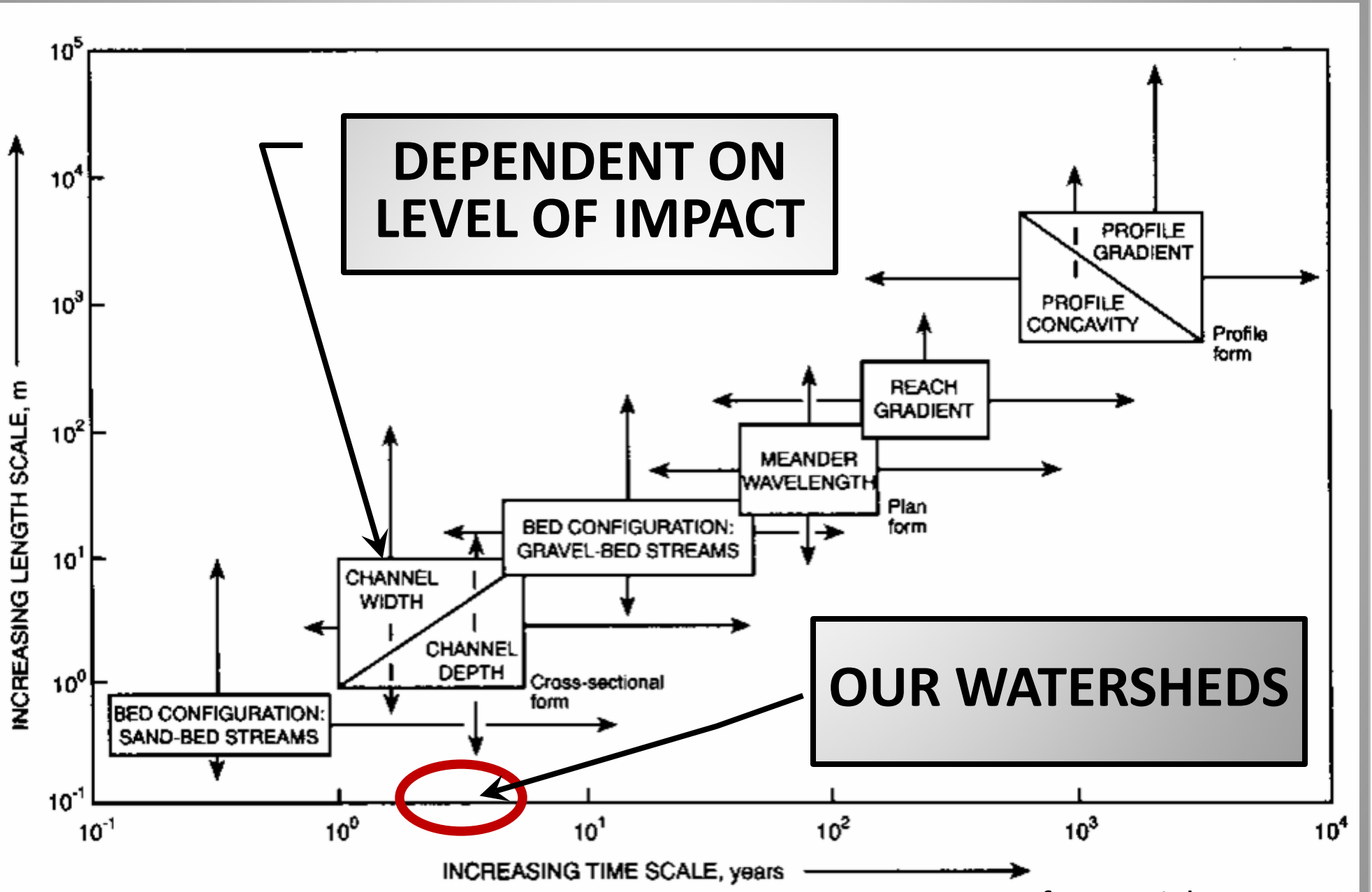


from FISRWG, 1998

As a disturbed channel evolves, the changes in channel conditions affect species differently

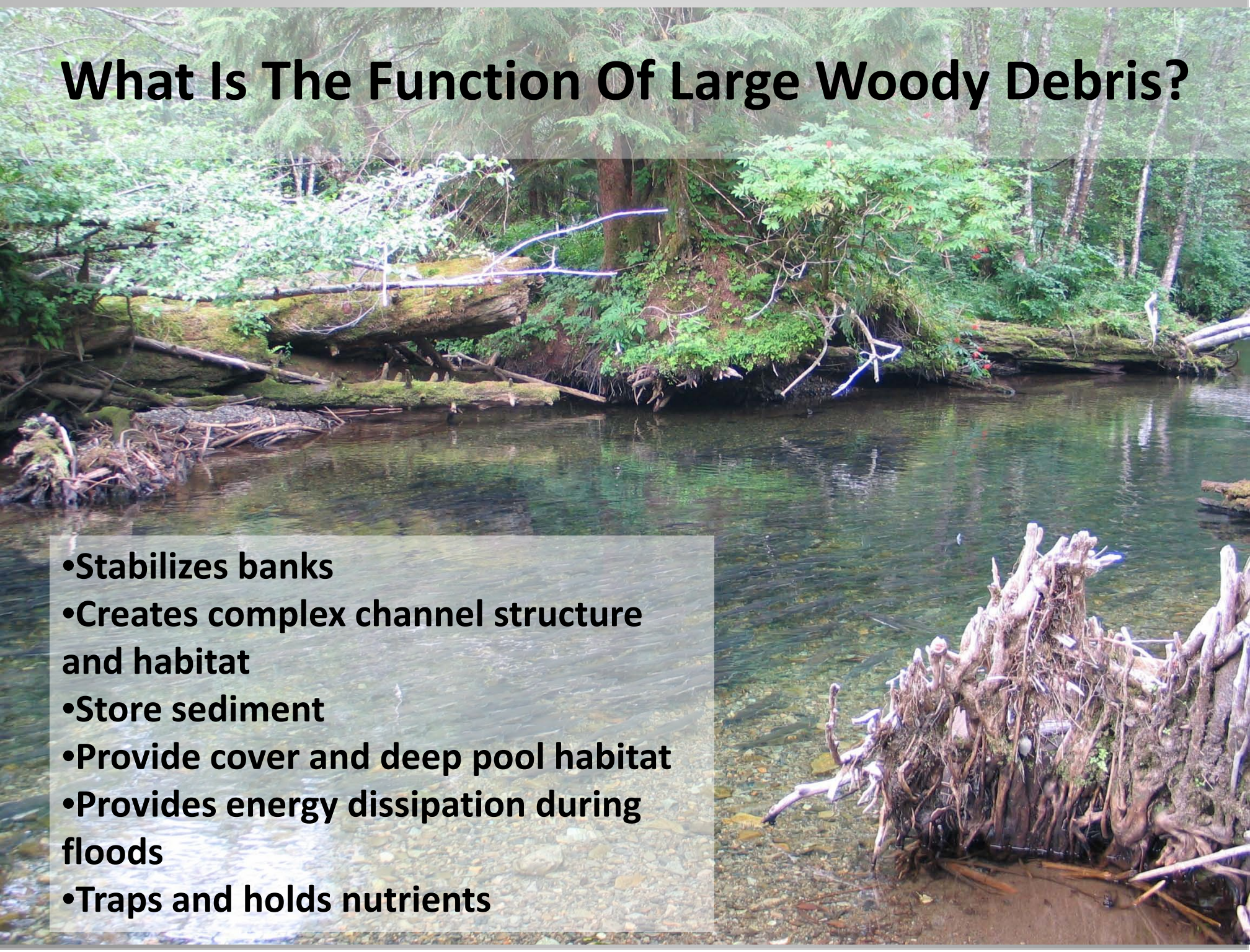
- ***Expect changes in***
- **Temperature**
- **Depth**
- **Width**
- **Substrate**
- **Complexity**

Timescales of Adjustment



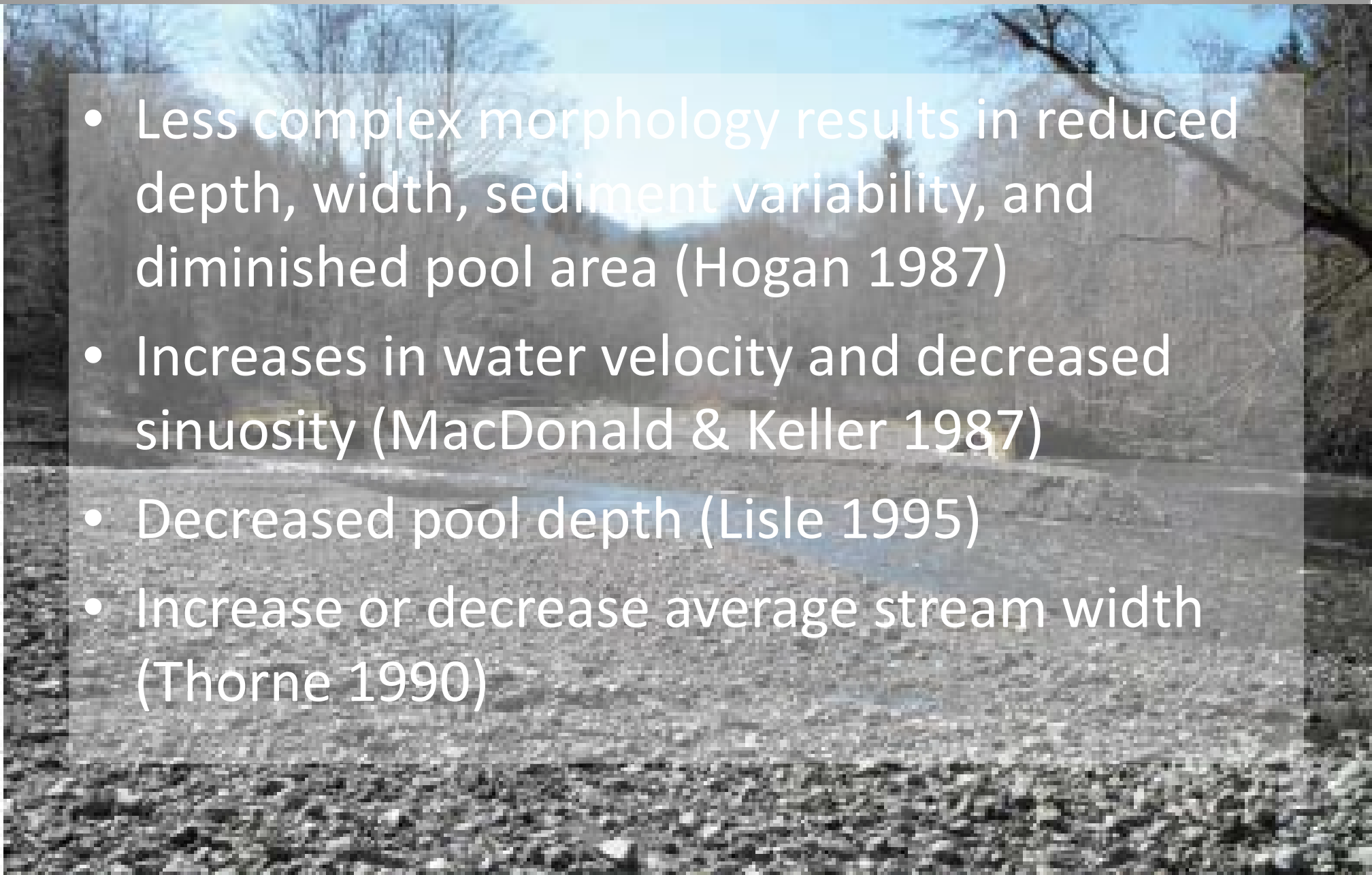
from Knighton, 1998

What Is The Function Of Large Woody Debris?



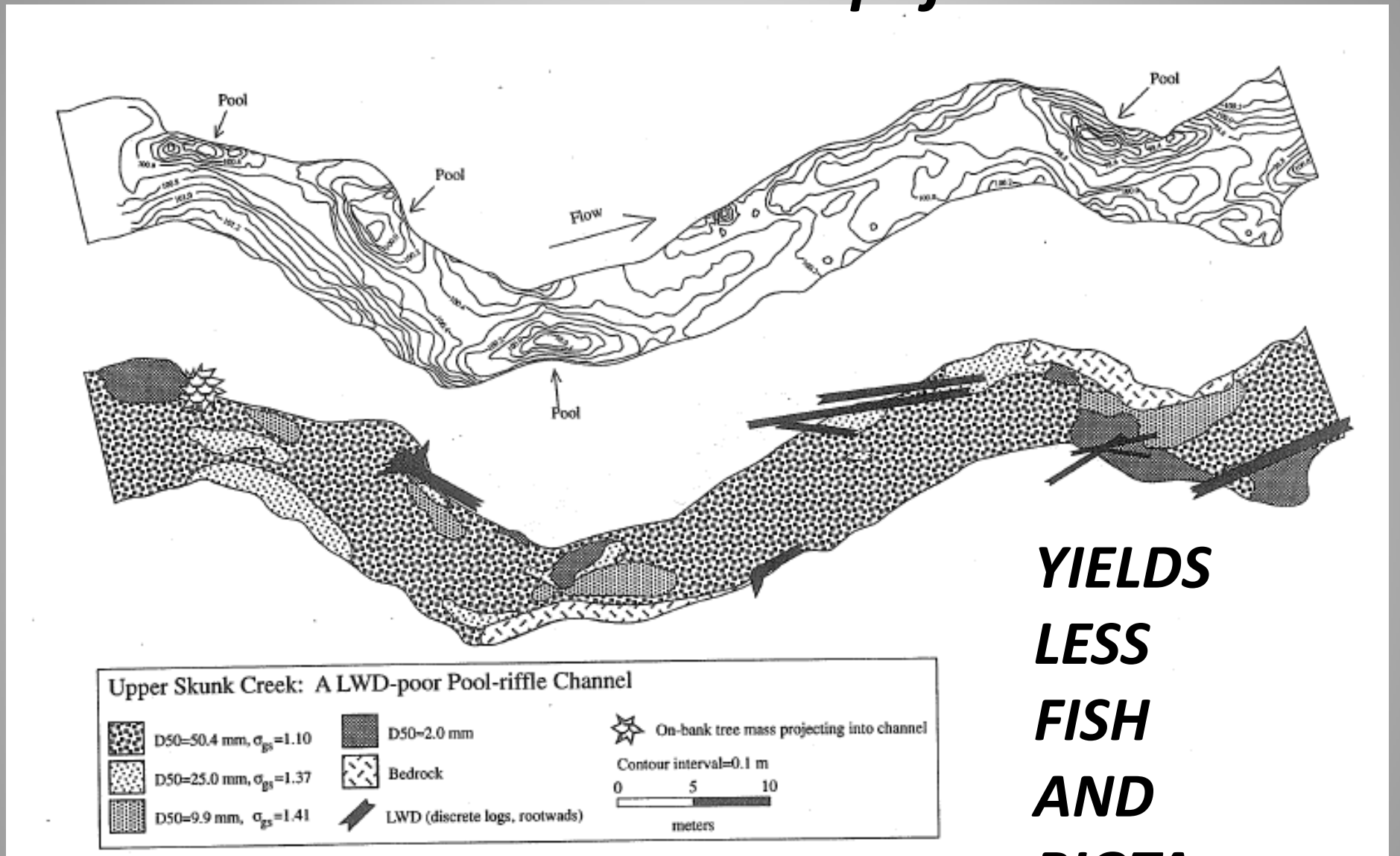
- Stabilizes banks
- Creates complex channel structure and habitat
- Store sediment
- Provide cover and deep pool habitat
- Provides energy dissipation during floods
- Traps and holds nutrients

What Happens to the Channel when Wood is Removed?



- Less complex morphology results in reduced depth, width, sediment variability, and diminished pool area (Hogan 1987)
- Increases in water velocity and decreased sinuosity (MacDonald & Keller 1987)
- Decreased pool depth (Lisle 1995)
- Increase or decrease average stream width (Thorne 1990)

LWD Poor Channels = Simplified Channel



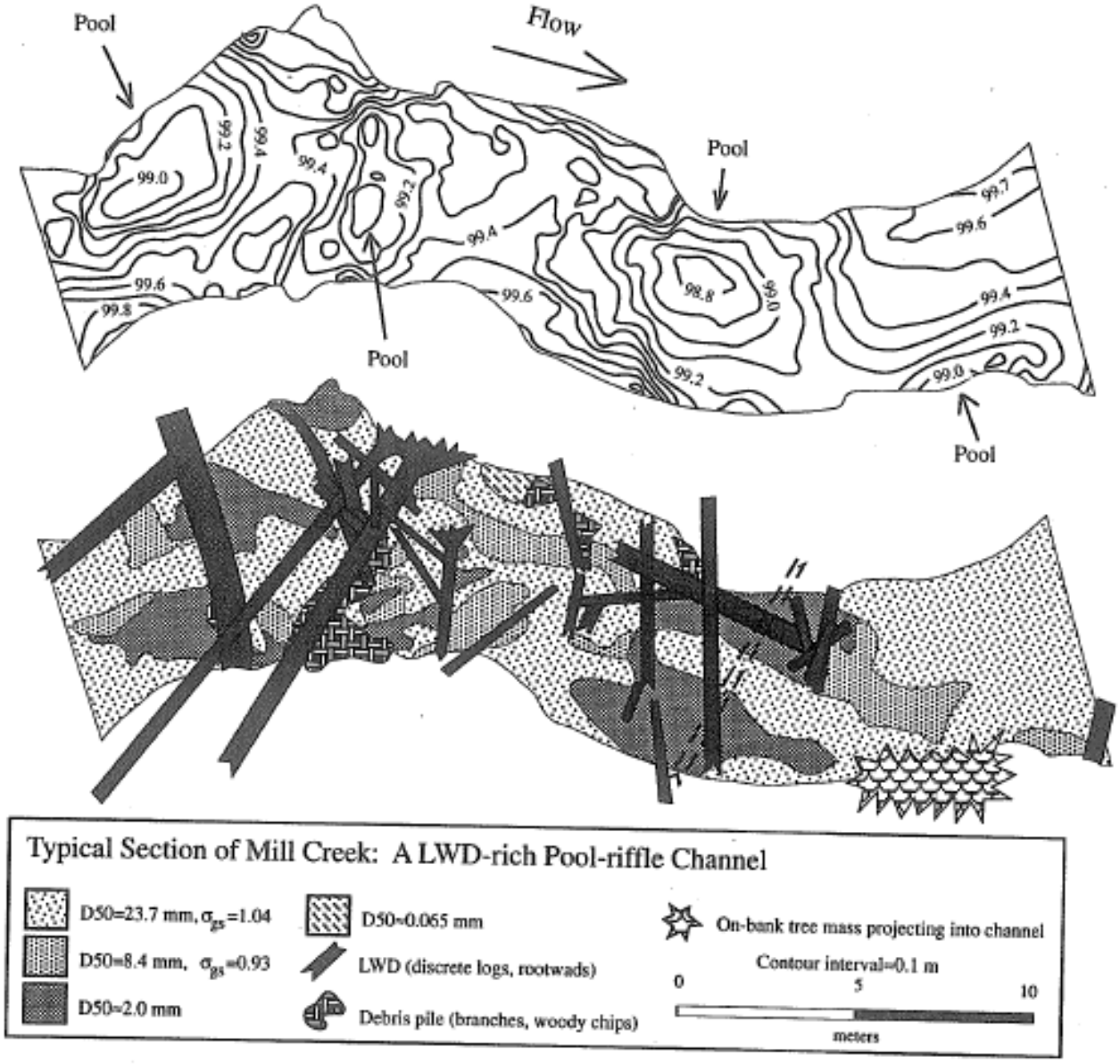
YIELDS LESS FISH AND BIOTA

Map 3: Upper Skunk Creek, a LWD-poor pool-riffle channel. Reach shown is ten channel widths long.

Buffington 1995

LWD Rich Channels = Channel Complexity

YIELDS MORE FISH AND BIOTA



Map 4: Typical section of Mill Creek, a LWD-rich pool-riffle channel. Section shown is 3.4 channel widths long.

Buffington 1995

As Time Goes On Storms, Decay, And Abrasion Continue To Remove Legacy Wood

Because Of Riparian Harvest There Is No Large Wood To Replace It!

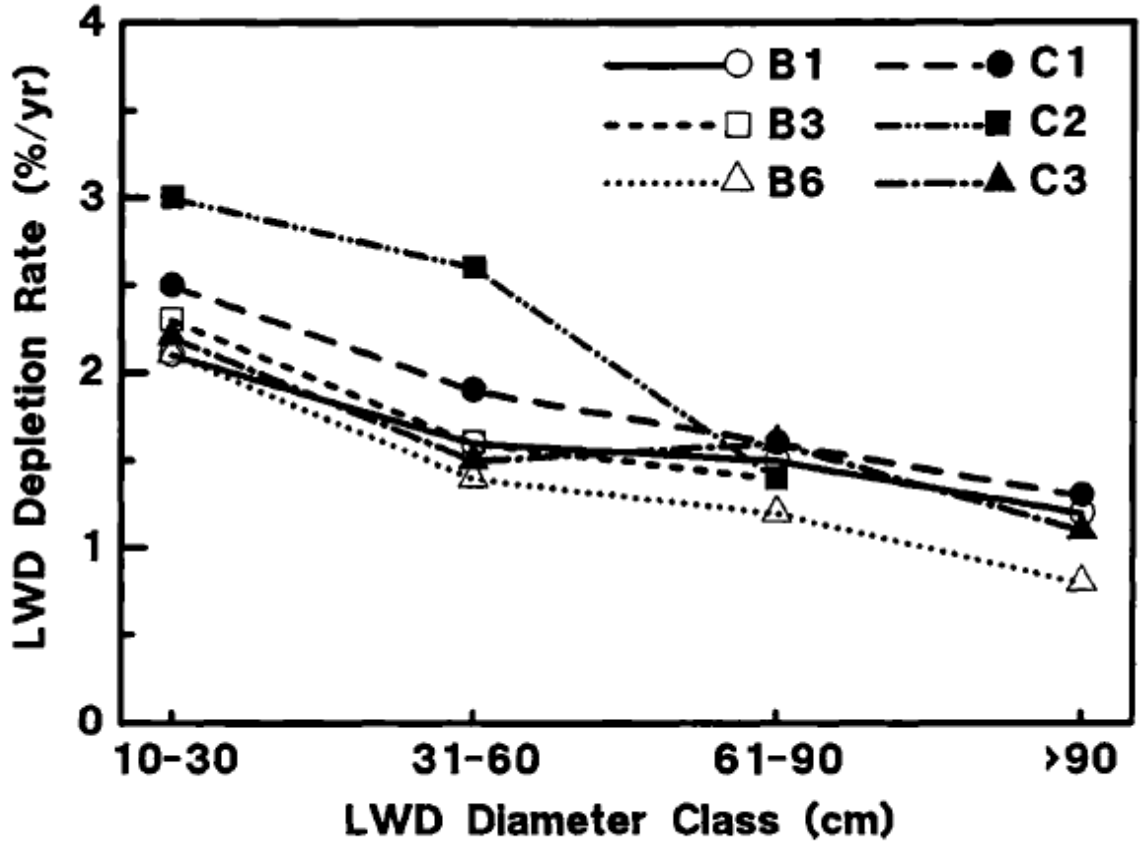
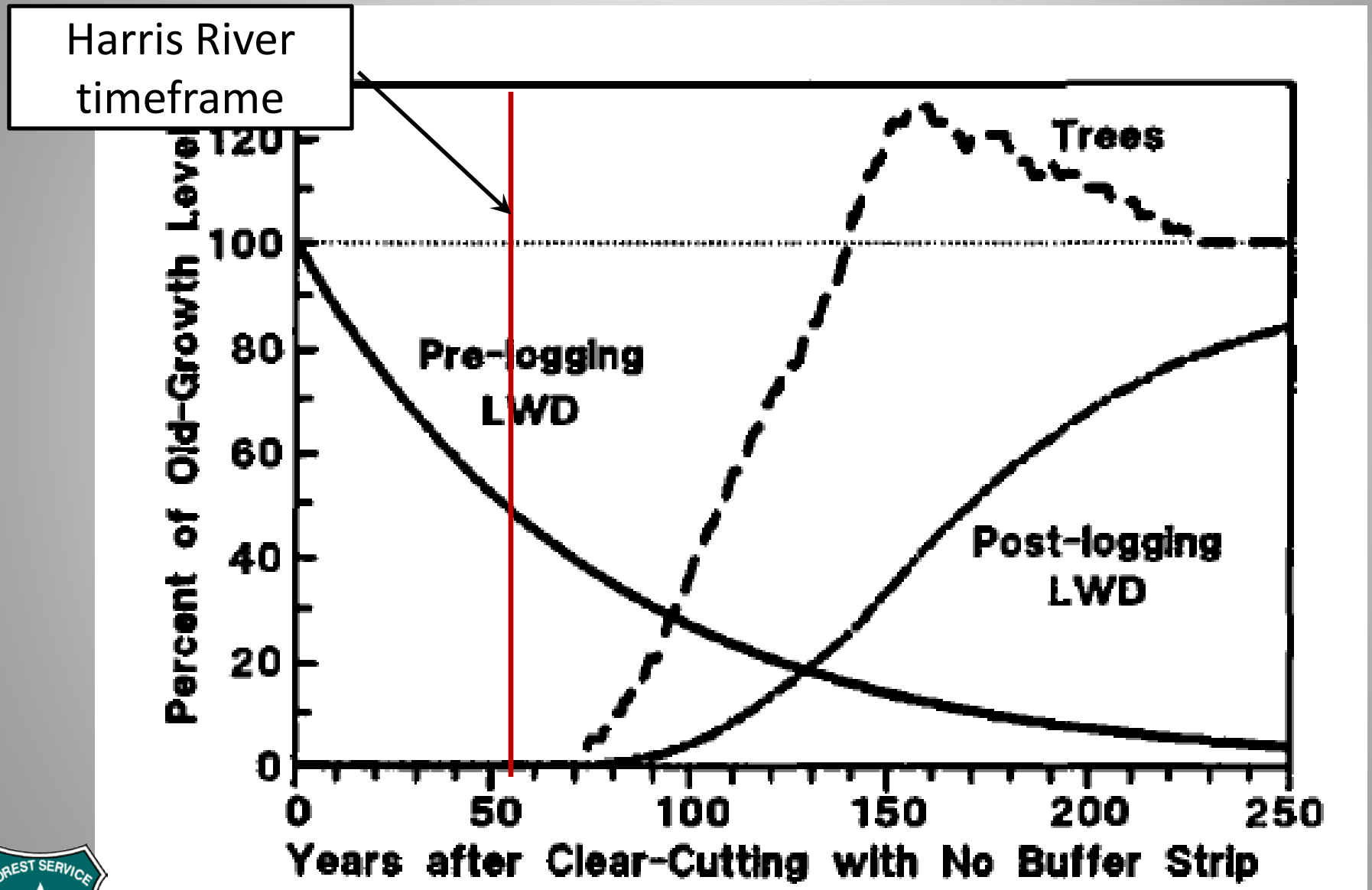


FIGURE 5.—Calculated depletion rates of large woody debris (LWD) in relation to LWD diameter class in six types of stream channels (B1, B3, etc., see Table 1) in old-growth forest, southeast Alaska. Depletion rates were calculated from the inverse of the weighted mean age of LWD in each channel type.

Murphy & Koski 1989

Rate of depletion of Large Woody Debris (LWD)

Percent Of Change In Large Wood In A Stream After Riparian Harvest

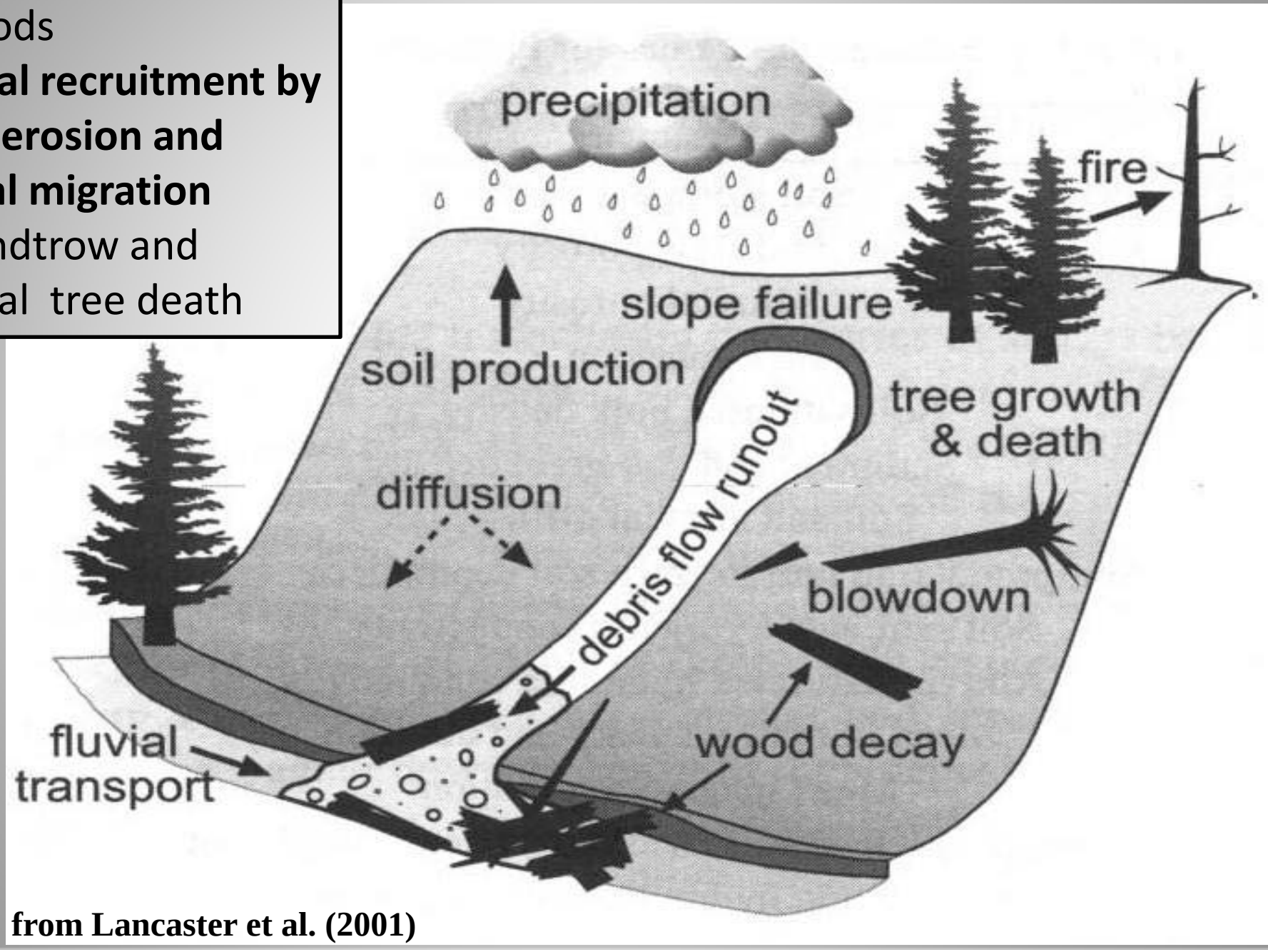


Murphy & Koski 1989

For wood greater than 2 foot in diameter

Mechanisms of Wood Delivery

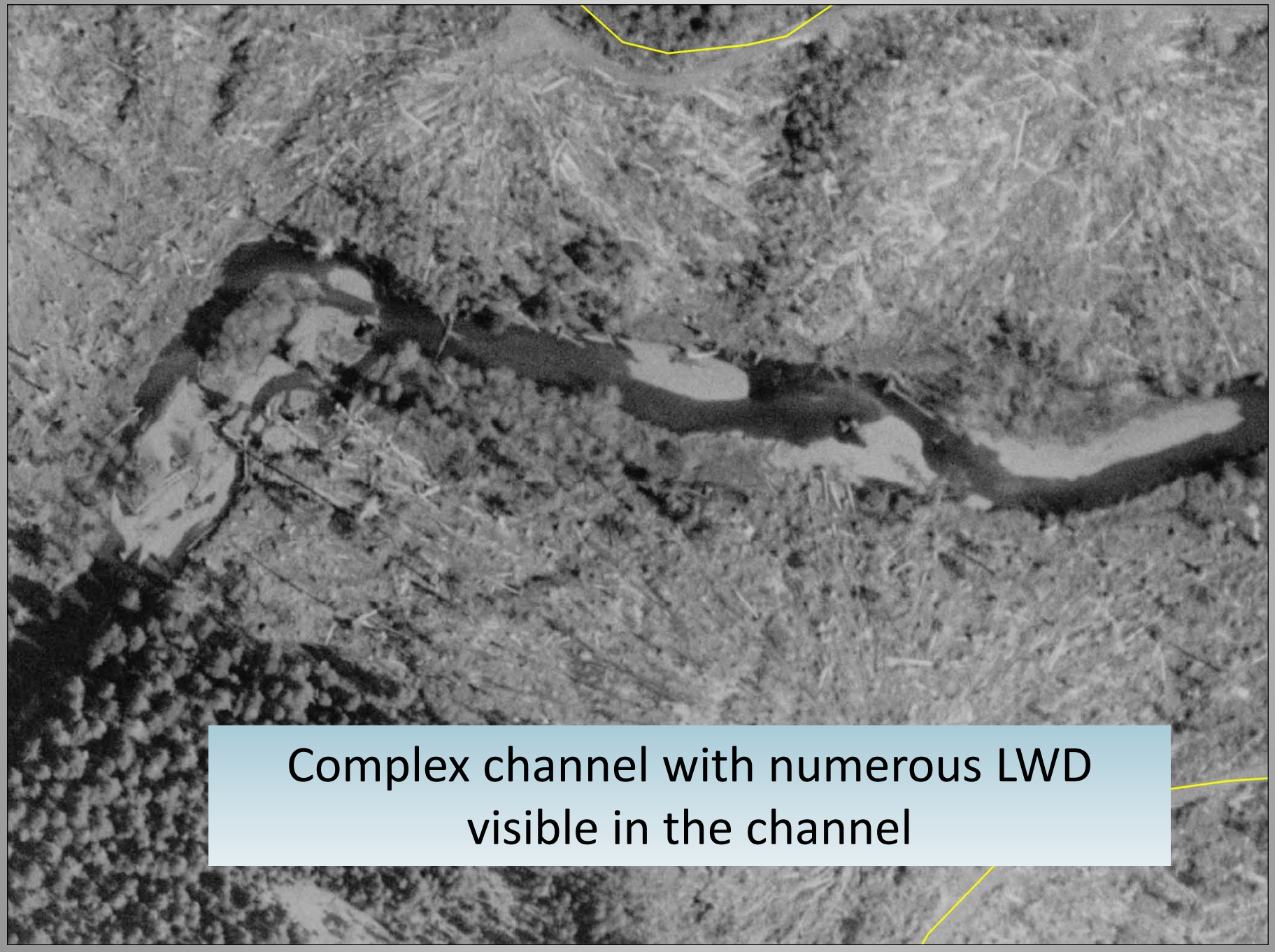
- ✓Debris flows
- ✓Floods
- ✓**Local recruitment by bank erosion and lateral migration**
- ✓Windtrow and natural tree death



from Lancaster et al. (2001)

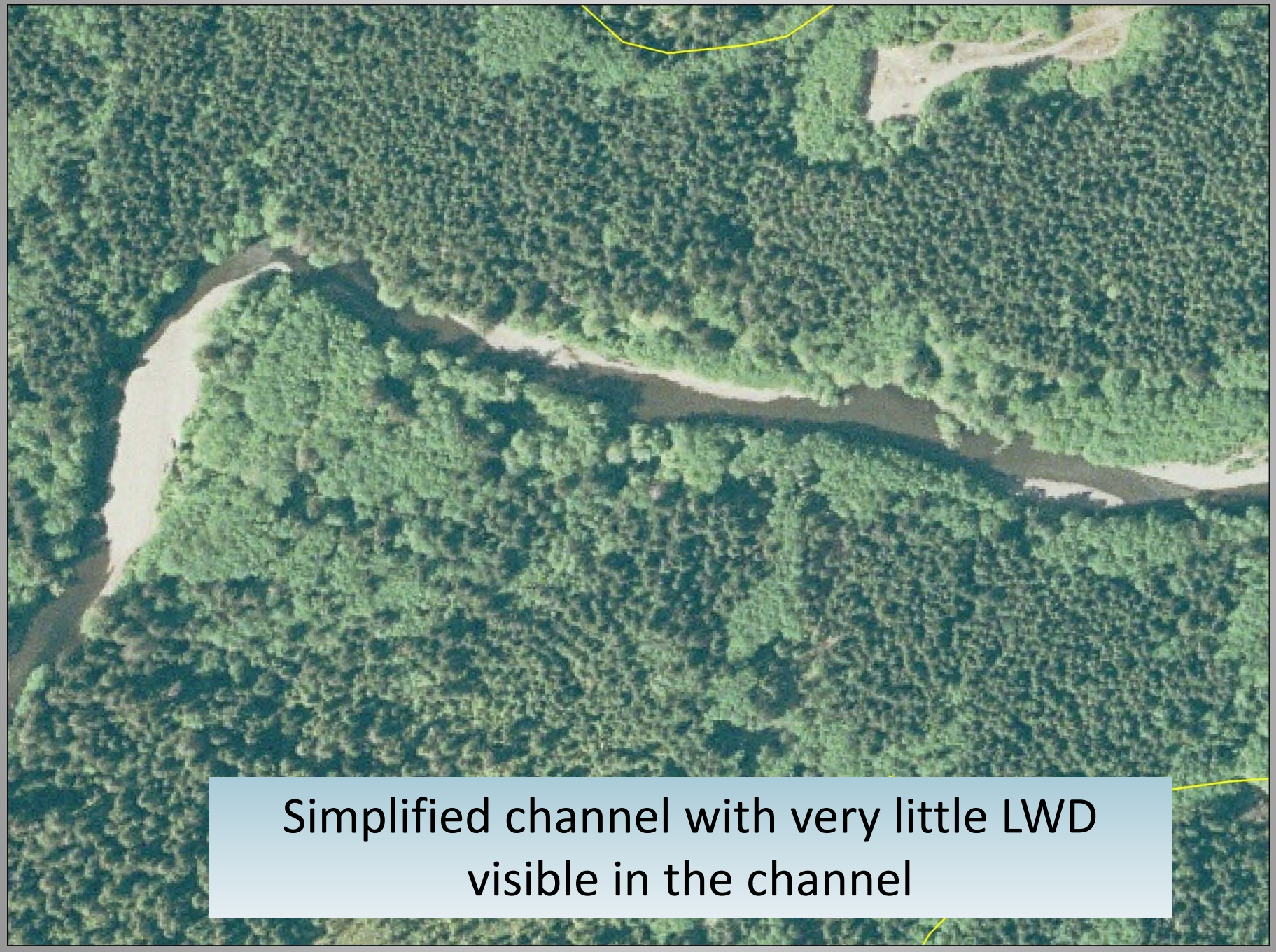
EXISTING CONDITIONS HARRIS RIVER 2007

LOWER HARRIS 1961 LWD



Complex channel with numerous LWD visible in the channel

LOWER HARRIS 2006 LWD



Metrics reflect changes from continual loss of large wood

Habitat data indicates Harris total key wood and pools/km to fair to good compared to metrics developed Tongass wide.

Assessments in the field compared good to poor sections indicate channel widening, loss of wood, etc

Harris River Habitat Data Analysis

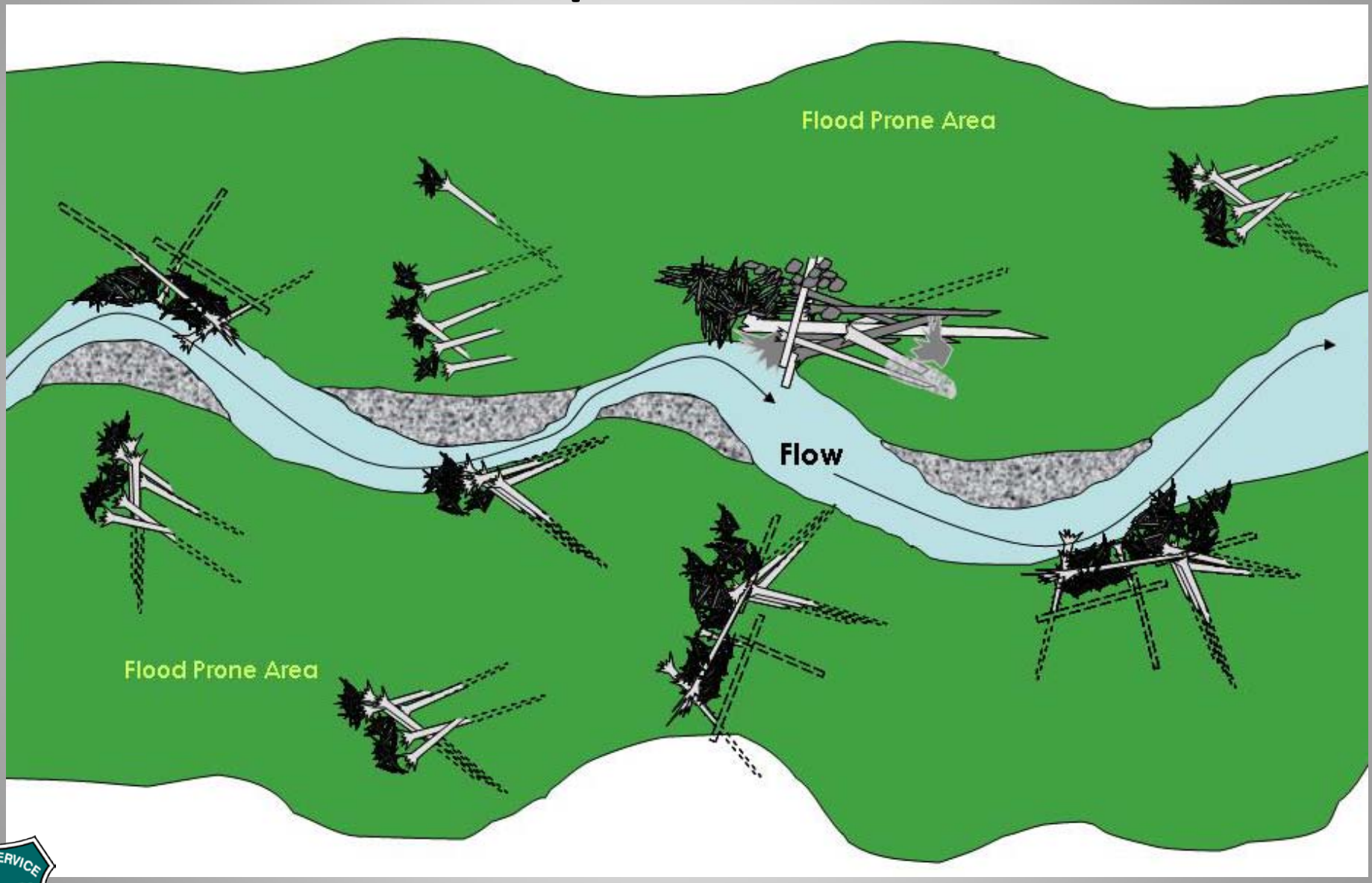
		Floodplain PG							Moderate Grade/Mixed Control PG						
Habitat Response Variables	Percentile	FP3	FP4	FP5*	Process Group FP	Harris Main FP5	Harris Sidechannel FP4	Rating	Habitat Response Variables	Percentile	MM1	Process Group MM	Harris Trail Trib MM1 2008	Harris Trail Trib MM1 2006	Rating
TKWD/m	25	0.10	0.06	0.02	0.04			Fair	TKWD/m	25	0.06	0.05	0.05		Fair
	25-50					0.05	0.05	Good		25-50				0.07	Good
	50	0.17	0.11	0.03	0.10					50	0.12	0.12			
	50-75									50-75					
	75	0.25	0.15	0.08	0.15			Excellent		75	0.14	0.14			Excellent
Pools/km	25	30	30	10	30		25	Fair	Pools/km	25	50	40	43	36	Fair
	25-50									25-50					
	50	40	40	20	45			Good		50	60	60			Good
	50-75									50-75					
	75	70	60	25	70	26		Excellent		75	70	70			Excellent

* low sample size (n<10)

Acting now would be less expensive and ensure greater success

Much easier to go from fair to good rather than poor to good

Geomorphic Design based on Reference Reach Conceptual Illustration

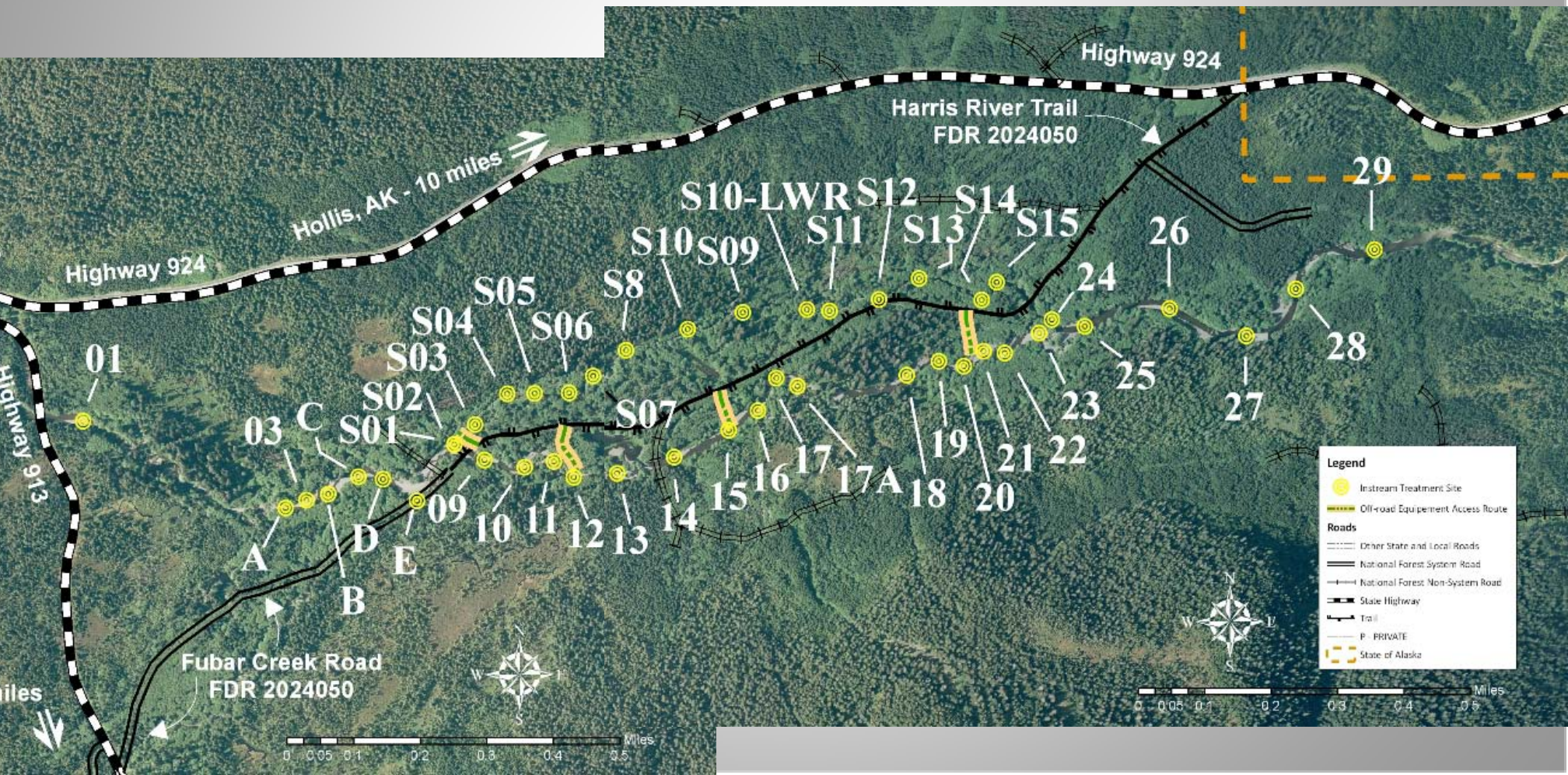


HISTORIC OLD GROWTH SECTION HARRIS RIVER 1959

REMNANT OLD GROWTH REFERENCE HARRIS RIVER 2007

Identify Locations where Improvement was Needed and Achievable

~ 85+ sites / complexes scattered thru out the watershed
in addition to floodplain wood



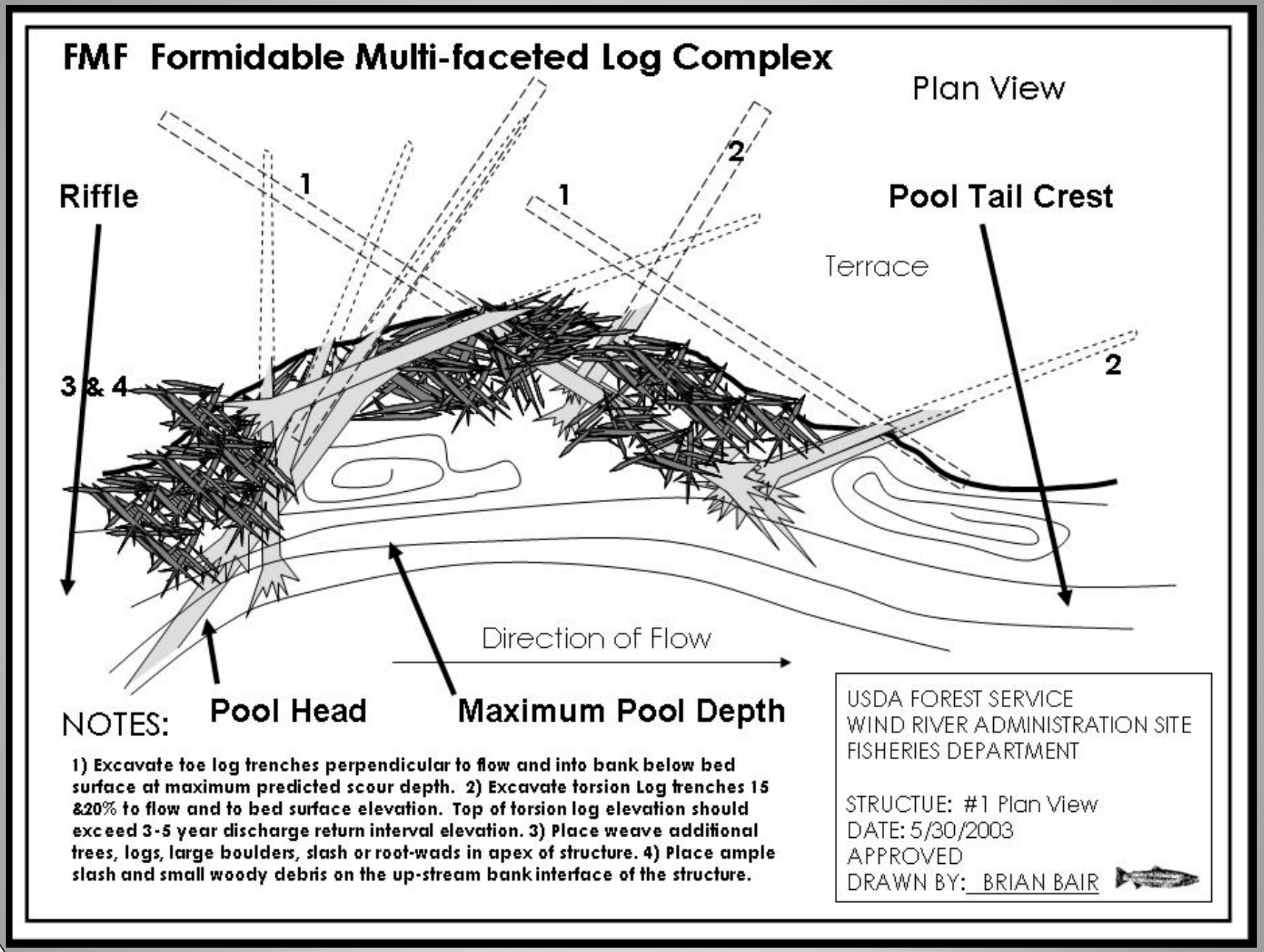
CONSTRUCTION METHODS

Helicopter placement

Excavator placement

Small tributary streams can use hand crew placement

EXAMPLE ENGINEERED LOG JAM
FUBAR CREEK 2006



Conceptual plan view design for "FMF" Log Jams.

APEX JAM – USED FOR ISLAND BUILDING OR PROTECTION AND CREATING SPLIT FLOW

BAR BUDDY

USED TO INCREASE BAR SIZE , DECREASE STREAM WIDTH, AND STORE SEDIMENT

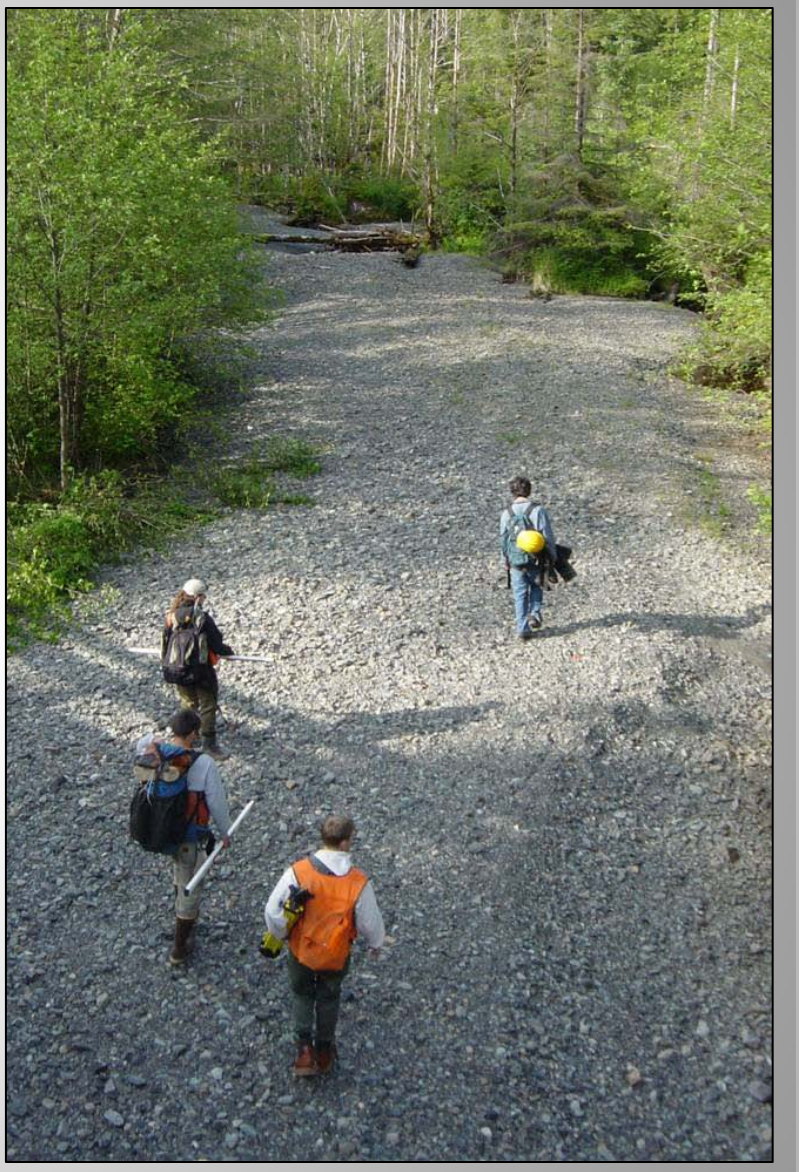
OFF CHANNEL HABITAT

POND RECONNECTION OR CREATION OR IMPROVEMENT

Example Major Channel Reconstruction
Fubar Creek 2006

Project Accomplishments – 2005 to 2011

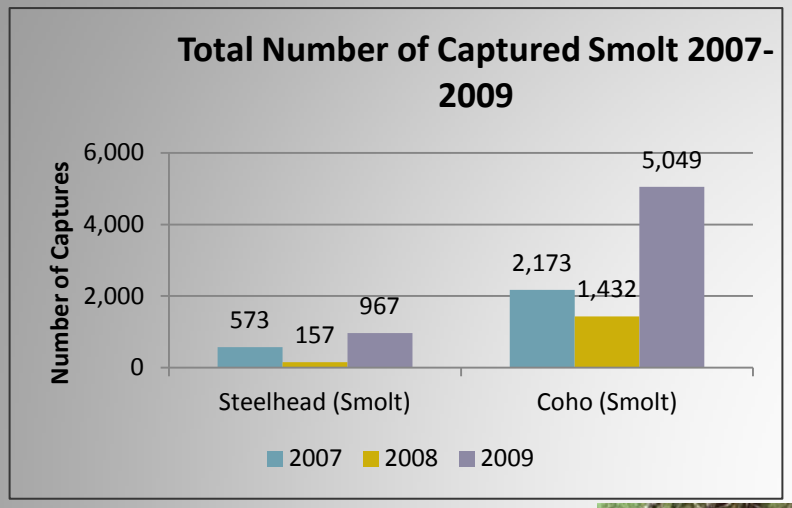
- ✓11 miles of main-stem and tributary restoration
- ✓Improved access to 9 miles of stream and 8 acres of ponds by habitat manipulation
- ✓8 miles of roads decommissioned or stored improving hydrologic connectivity and reducing sediment delivery
- ✓350 acres of riparian habitat thinned to restore stream riparian function
- ✓150 acres of upland young growth thinned to re-establish understory vegetation
- ✓2,300 log (young and old growth) with and without rootwads attached placed in the Harris and key tributaries to improve fish habitat and stream morphology



FUBAR CREEK
BEFORE PROJECT

Table 2. Outmigration Estimates for Age 1+ Coho salmon and Steelhead 2007-2009.

Fubar Smolt Trap 2007-2009



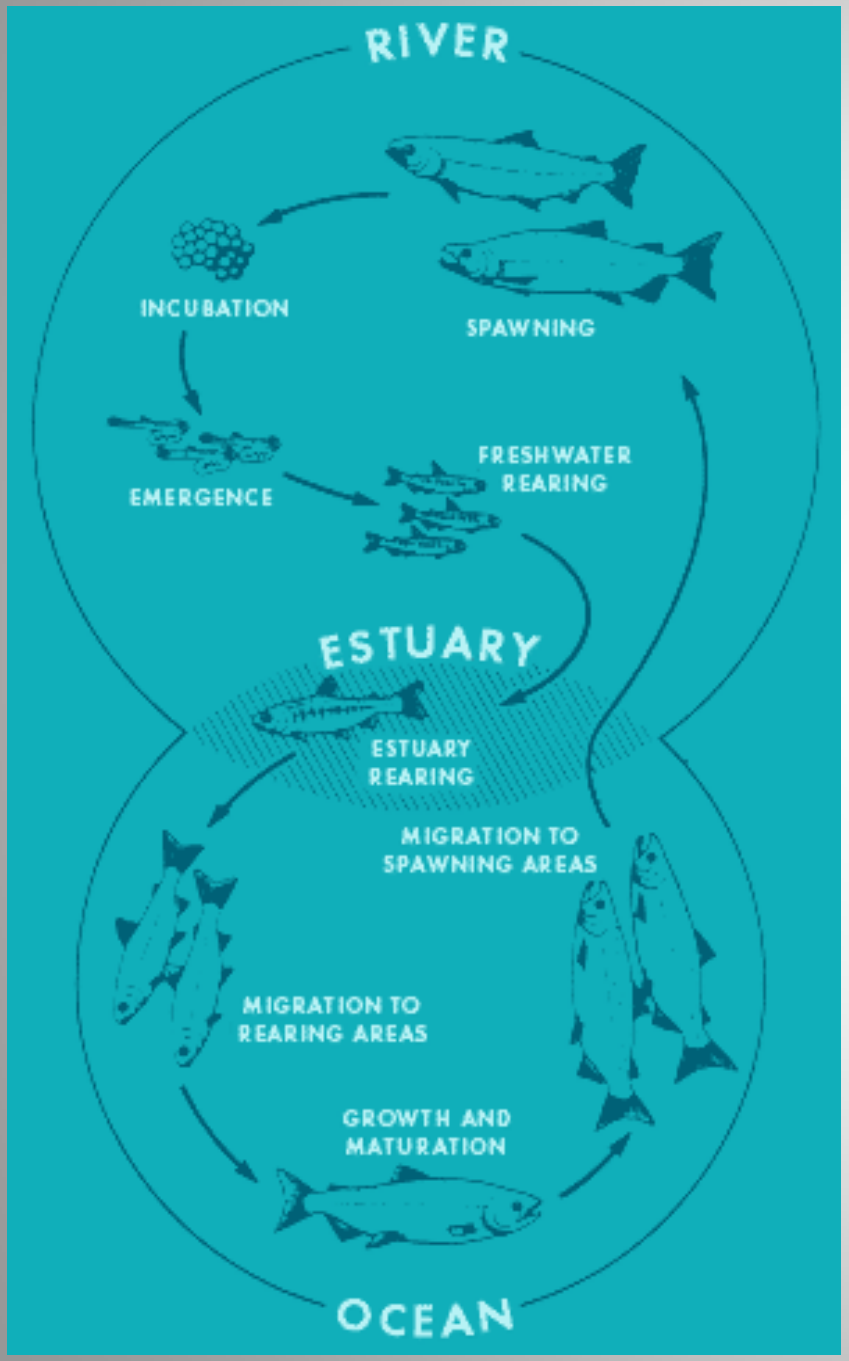
Species	2007 Population Estimates +/- 95% CI	2008 Population Estimates +/- 95% CI	2009 Population Estimates +/- 95% CI
Coho	4,098 +/- 229 “good”	5,054 +/- 231 “good”	10,143 +/- 172 “good”
Steelhead	1,775 +/- 230 “good”	1,081 +/- 445 “poor”	5,059 +/- 360 “good”

Fubar Creek Monitoring

Table 4. Wood Counts for Fubar Phase II reach.

Phase 2 Segment	**1998**	**2008**
Total Wood Count	200	445
Total Pool Count	6	24
Avg. Residual Pool Depth	0.73 m	0.84 m

Why Should You Care And What Does It Mean?



THE OCEAN IS HALF OF THE EQUATION, WILD PINKS AND CHUMS ALL SPAWN IN FRESHWATER STREAMS

<u>BOTTOMLINE</u> : POOR STREAM HEALTH = LOW WILD SALMON NUMBERS = LESS FISH AVAILABLE FOR EVERYONE


???QUESTIONS???