OKANOGAN-WENATCHEE NATIONAL FOREST

Whole Watershed Restoration:

CONCEPTS OF NATURAL PROCESS AND

ASSESSING IMPAIRMENT AT SUB-WATERSHED SCALES

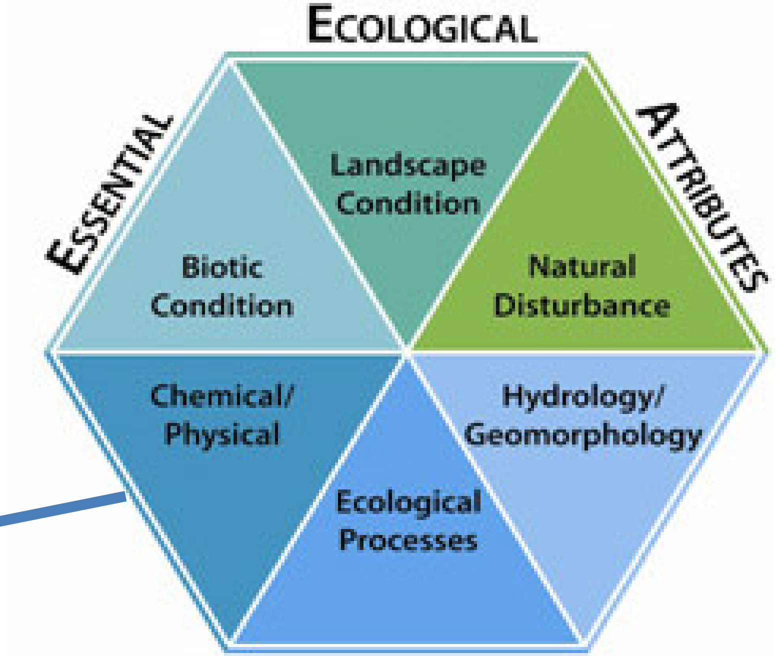
WATERSHED HEALTH:

“Health” can be viewed as a relative measure of the deviation from some “natural” or baseline condition. (EPA 2011)

IMPAIRMENT:

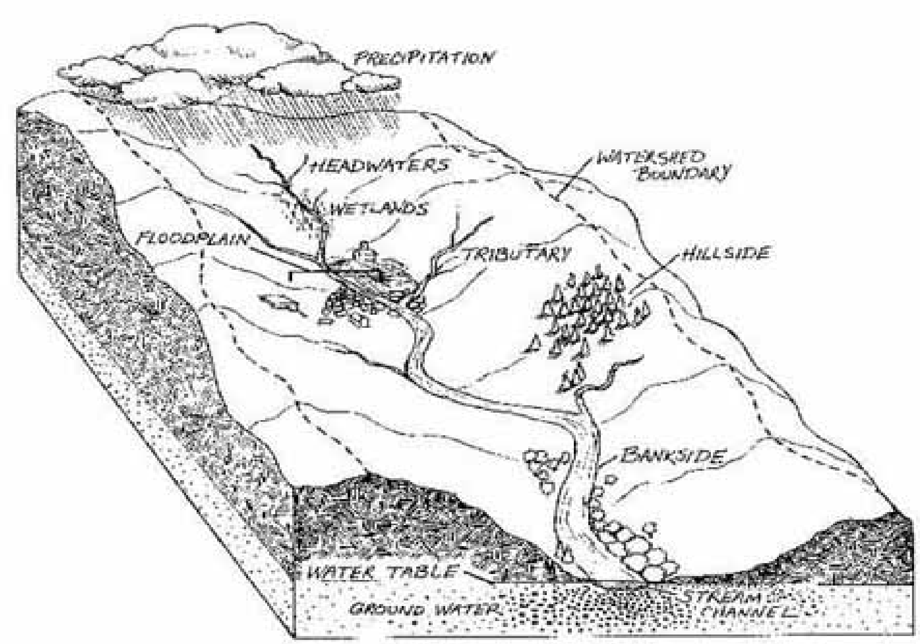
Disturbances leading to <u>physical</u> (e.g., increase water energy release component into a stream causing geometric channel adjustment), <u>chemical</u> (e.g., introduction of pollutants at concentrations harmful to the organisms), and/or <u>biological</u> (e.g., introduction of non-native aquatic vertebrate, invertebrate or pathogenic species) functional alterations of “natural” conditions.

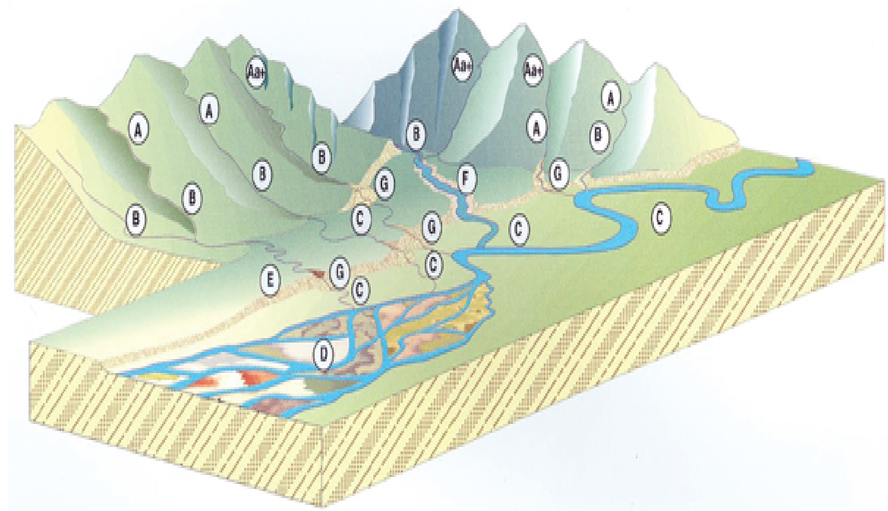
EPA HEALTHY WATERSHED ASSESSMENT MODEL ---------------->
(EPA 2002)

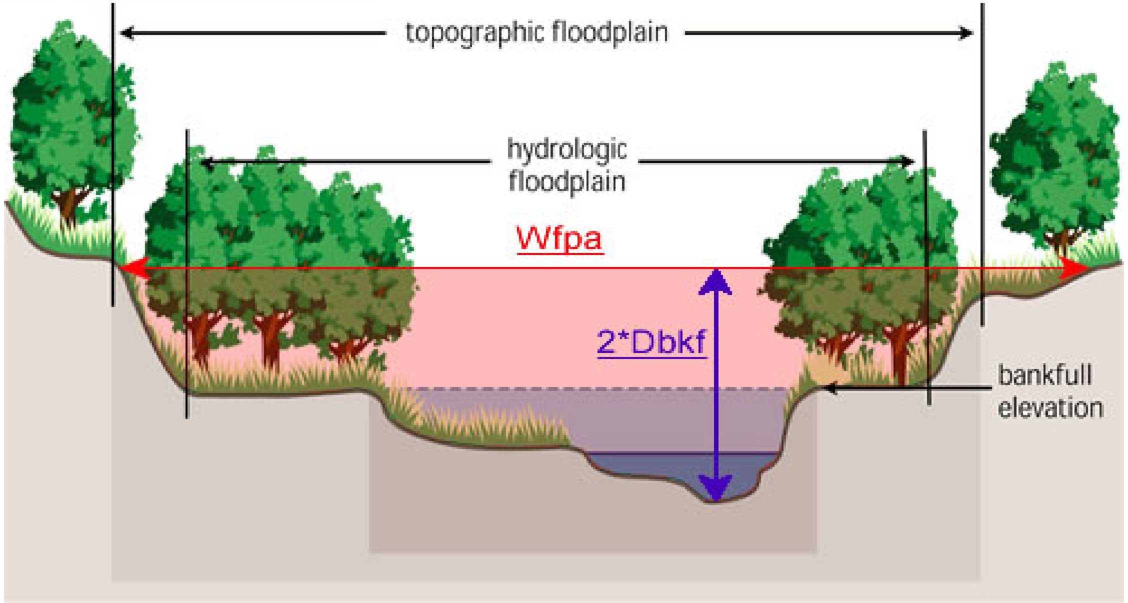


<u>Evaluation</u>
STRESSORS/INDICATORS

“NORMAL” Functioning Watersheds and Streams







Watershed Condition Framework: Process Review

WCF

Focus on 6th Code WA's

Step A….Step B….Step C….Step D….Step E….Step F

WATERSHED CONDITION ASSESSMENT

Classify WA Condition & Prioritize WA's for Restoration

Eight Mile Creek

(Lower Chewuch River)

Tillicum Creek

(Entiat River)

Upper Peshastin Creek

(Wenatchee River)

Upper and Lower Little Naches River

(Little Naches River)

DEVELOP & IMPLEMENT

Watershed Action Plans (Essential Projects)

WHOLE WATERSHED APPROACH

&/OR

REACH LEVEL APPROACH

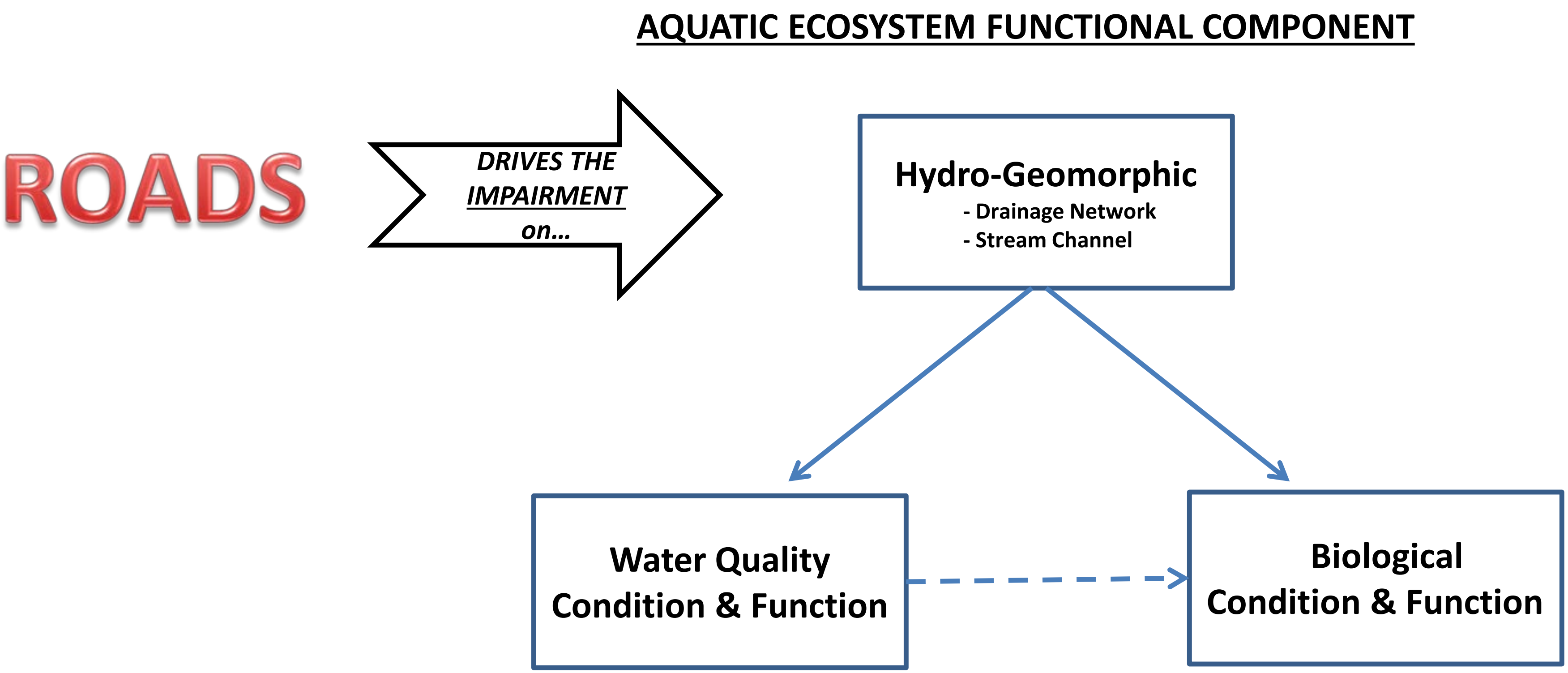
EFFECTIVENESS

Track Costs, Monitor/Validate

????????

GOAL: Improve Watershed Condition Class

Mother Nature's Response Mechanisms To Roads: AQUATIC ECOSYSTEM

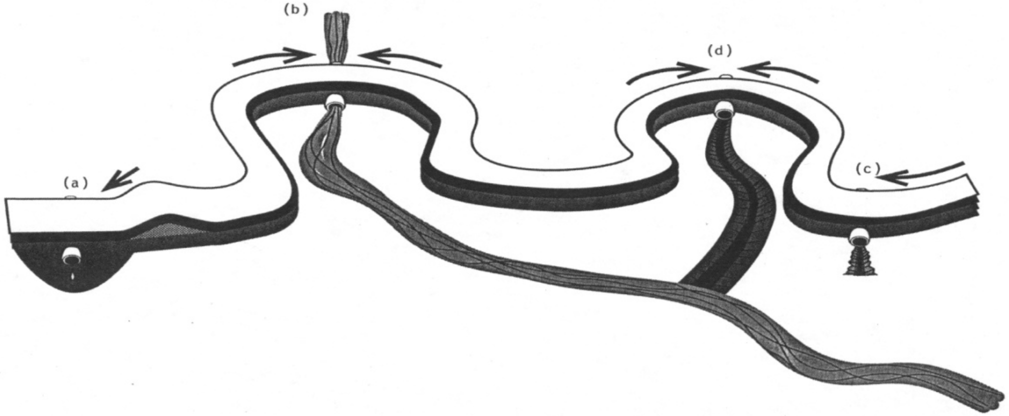


Conceptual Relationship

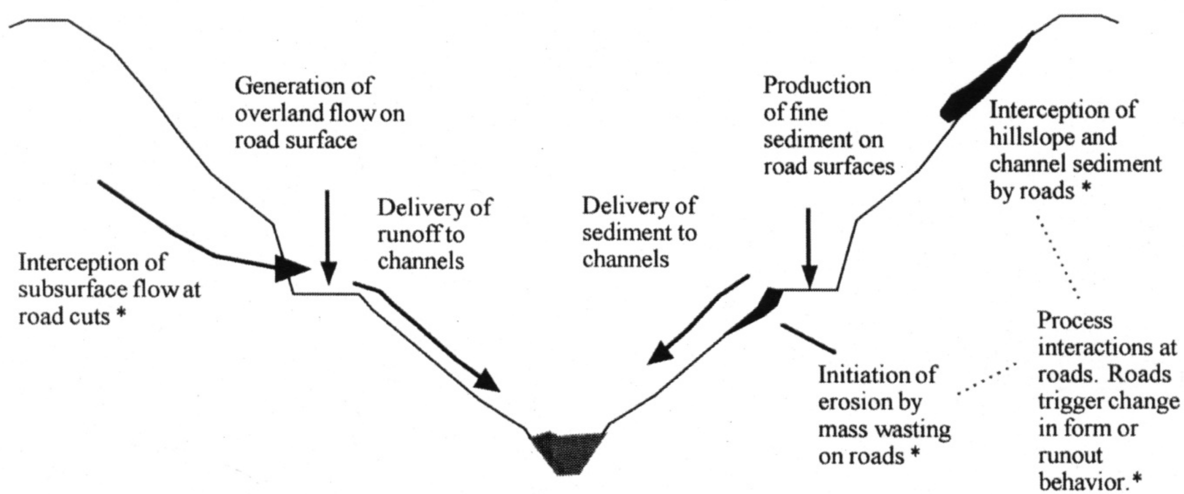
DI = (RN) HG + WQ + BC -------------> Magnitude of road influence on aquatic ecosystem function.

DI: Degree of Impairment
RN: Road Network (density and location)
HG: Hydro-Geomorphic Functional Impacts
WQ: Water Quality Functional Impacts
BC: Biological Condition Functional Impacts

Mother Nature's Response Mechanisms To Roads: DRAINAGE VIEW

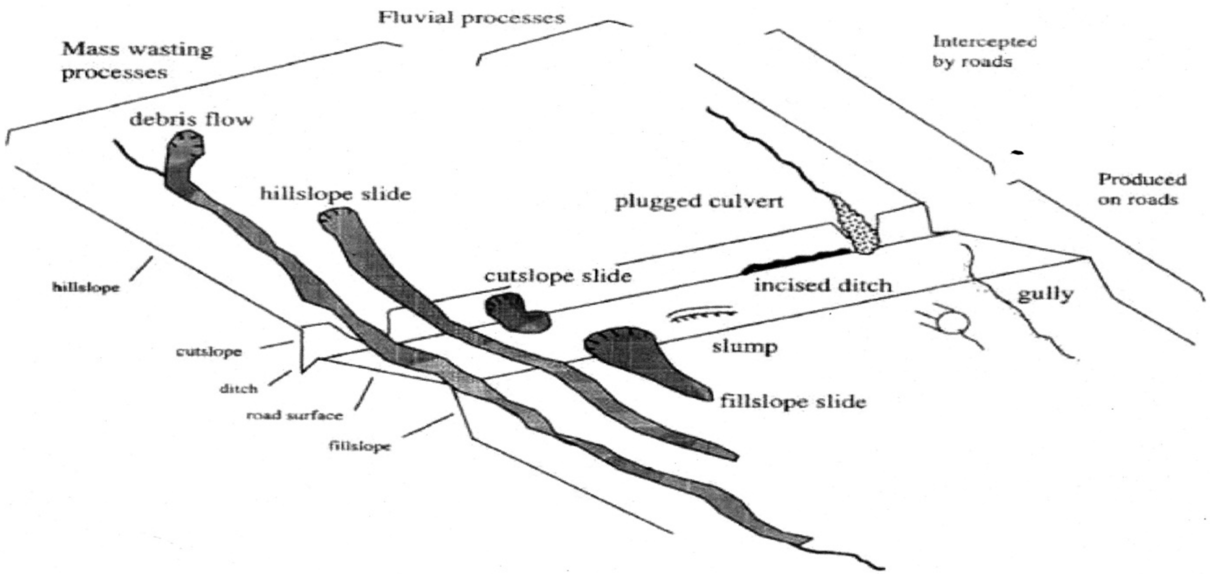


Wemple 1994

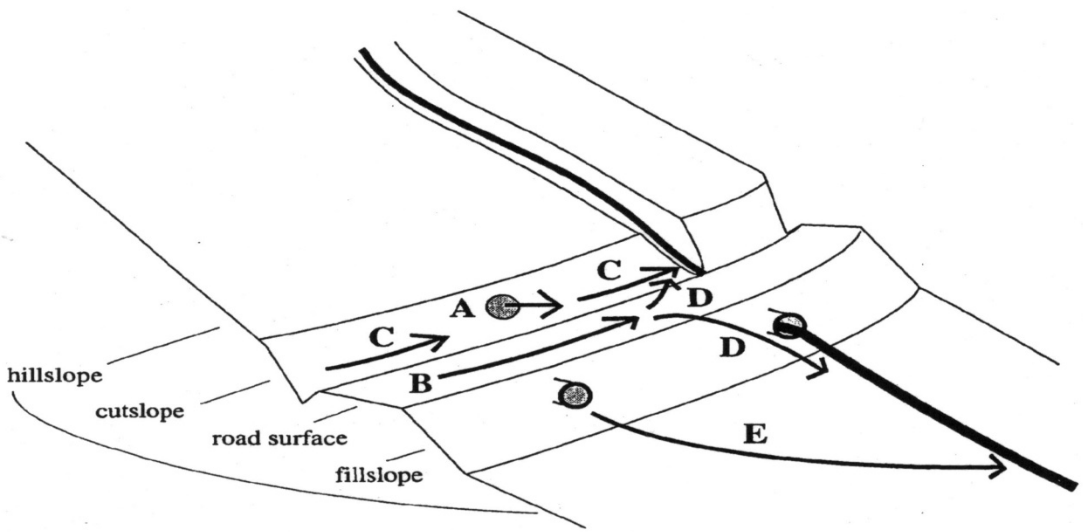


Wemple 1998

Mother Nature's Response Mechanisms To Roads: DRAINAGE VIEW

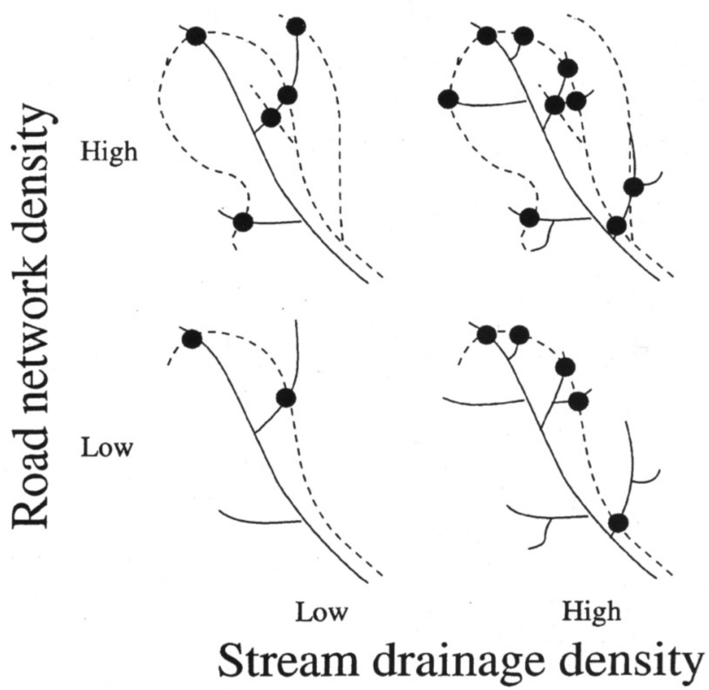


Wemple et al. 2001

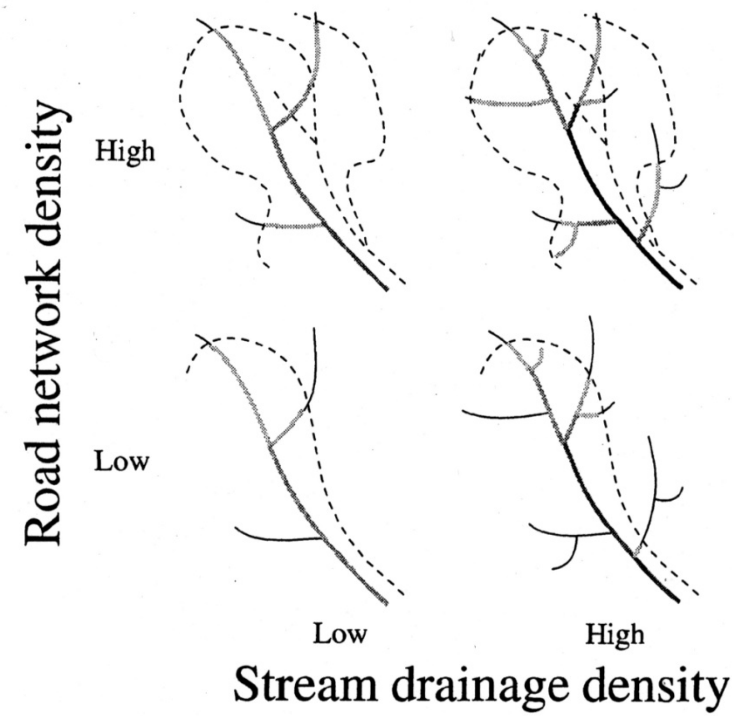


Jones et al. 2000

Mother Nature's Response Mechanisms To Roads: DRAINAGE VIEW



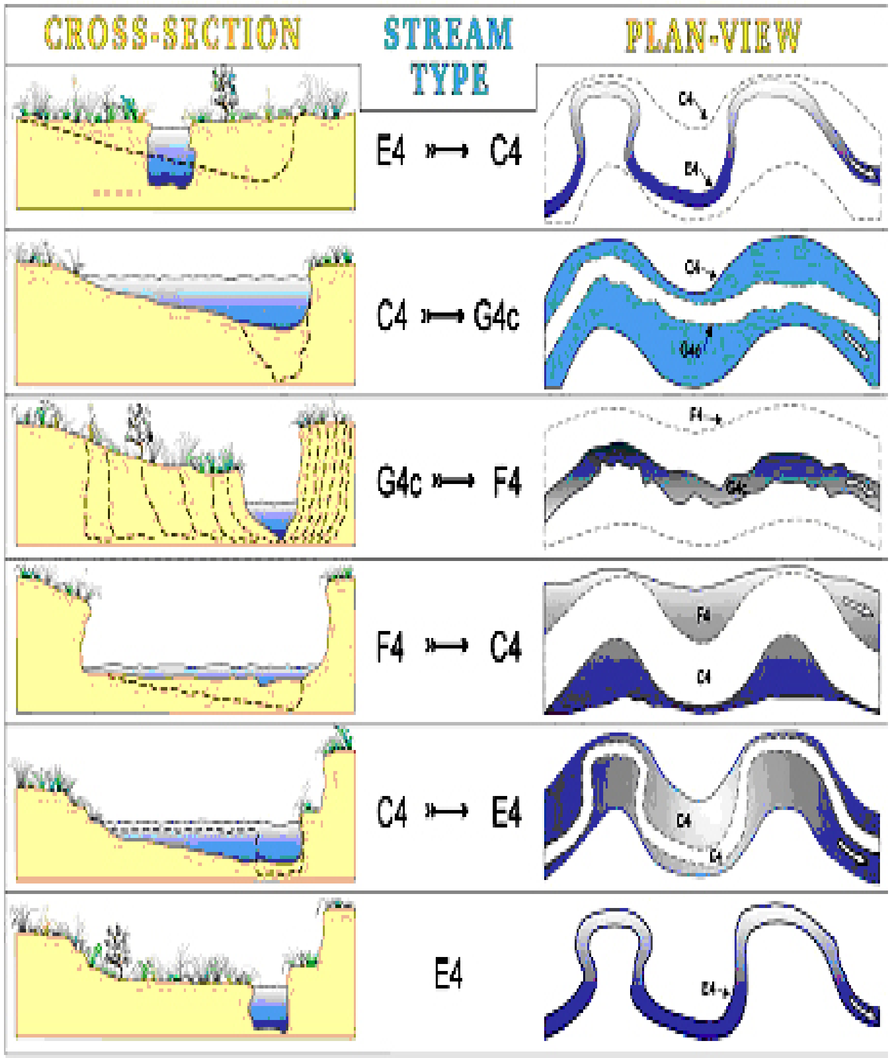
Jones et al. 2000

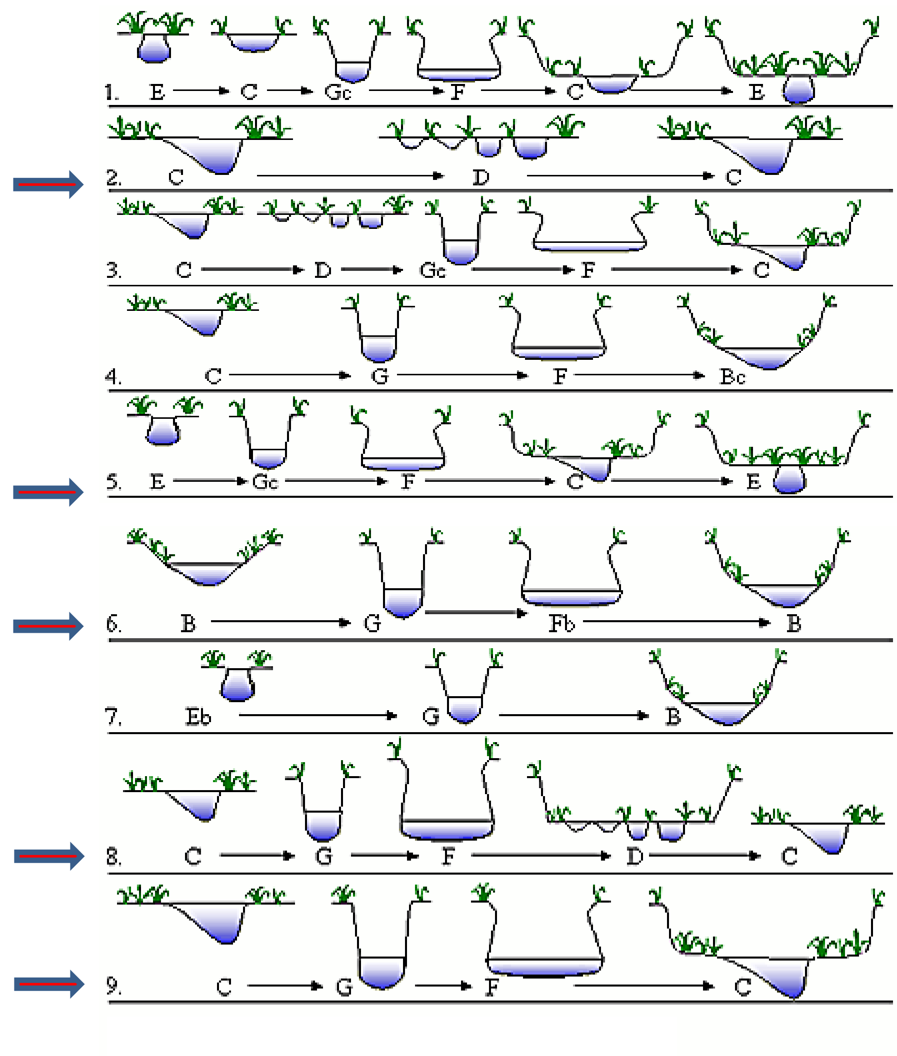


Jones et al. 2000

Mother Nature's Response Mechanisms To Roads: STREAM CHANNEL VIEW

What happens when streams are de-stabilized and water energy release component (flow) AND debris are increased?





Rosgen 1994 and 1996

Mother Nature's Response Mechanisms To Roads: WATER QUALITY & FISH VIEW

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Putting These Concepts Together In A

Watershed Restoration Framework:

THE PRINCIPLES

Pin-Point Where The Interactions Are Occurring

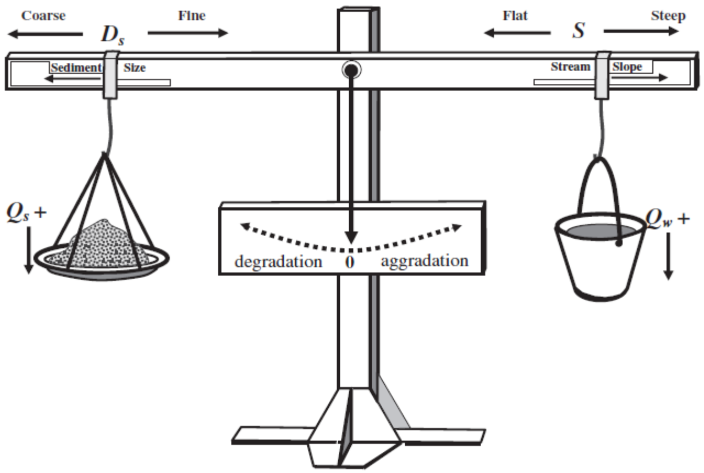


Fig. 1. Depiction of the original Lane's relation as a balance (after Prof. Whitney Borland, Colorado State University, unpublished).

Lane 1955

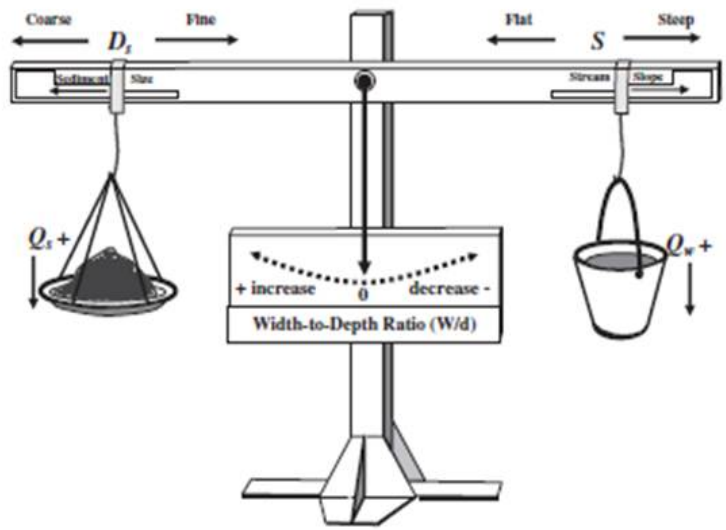


Fig. 9. Graphical depiction of the expanded Lane's relation, where potential adjustment to the width-to-depth ratio is reflected by the pointer and scale in the center of the balance.

Dust and Wohl 2012

Climate Change: Considerations

In general, CH prediction model outcomes include:

- Hotter & Drier
- Greater Chance for More Intense Precipitation Events
- Greater Chance for More Intense Runoff Patterns

Then, why would we want to encourage conditions that lead to……

- High drainage densities in watersheds;
- Increase the efficiency in which watershed & streams drain themselves;
- Increase water quality impairment variables, such as stream temperature & sediment;
- Decrease and limit areas where focal fish species spawn, rear and forage.

The Priority Restoration Scale Model: Adaptation For Road Cause Impairments

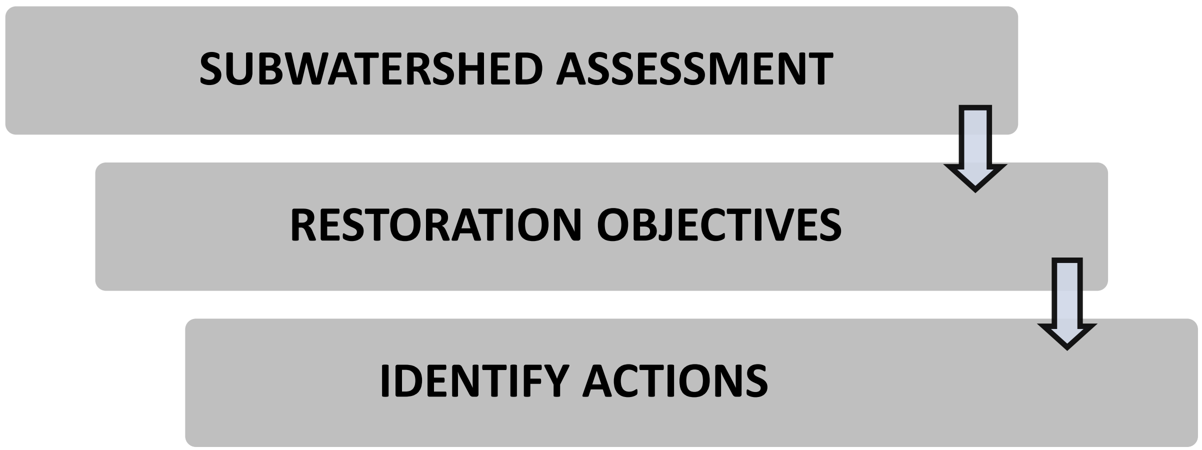
Restoration Method	% of Impairment Reduced
Priority 1: DECOMMISSION system roads (could be any ML) that have long-standing impairment on wa/aquatic resources and contribute to a suite of measurable objectives;	90-95
Priority 2: DECOMMISSION non-system roads that are causing impairment to watershed and aquatic resources;	90-95
Priority 3: RELOCATE ML 2-5 roads where access to a site or area is deemed "necessary" AND DECOMMISSION the abandoned road segment;	80-90
Priority 4: HYDROLOGICALLY CLOSE system roads (i.e. ML-2 to ML-1; ML-3 to ML-1, etc.) as a part of a SUSTAINABLE future road network need AND where that need isn't immediate and streams and associated water quality/biological components can be resilient to effects of road re-opening;	60-80
Priority 5: UPGRADE roads determined to stay on the system (i.e. upsizing a road crossing for water quality improvement and aquatic organism passage).	50-70

Now Let's Tie The Concepts Of Natural Process Together!!

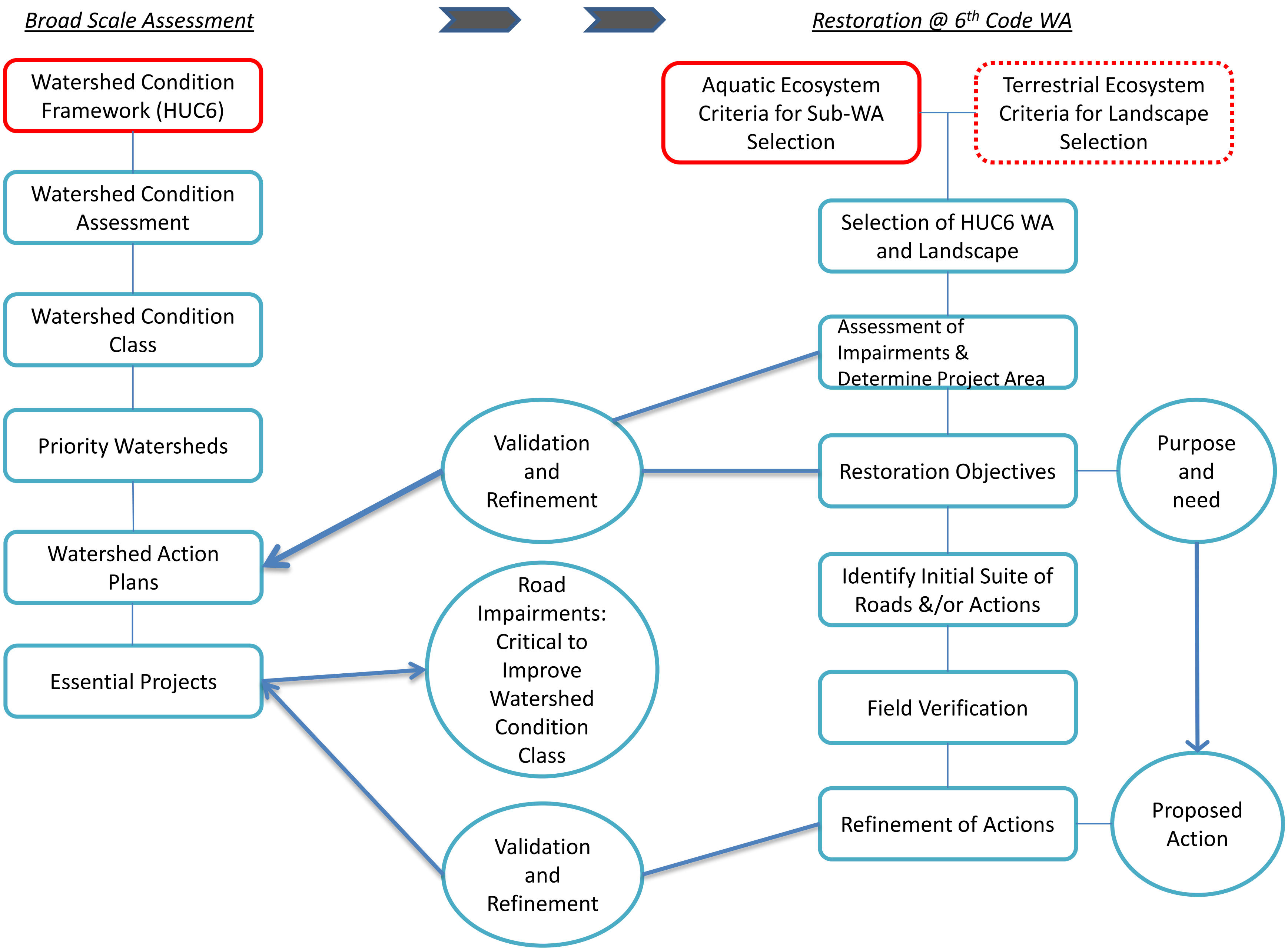
***BUT REMEMBER*……**

We Are Choosing To Engage Active Management On A Section Of Land (Watershed or Sub-watershed) For The Purposes Of Achieving Restoration.

Watershed and Aquatics: The Whole Watershed Restoration Planning & Design Process



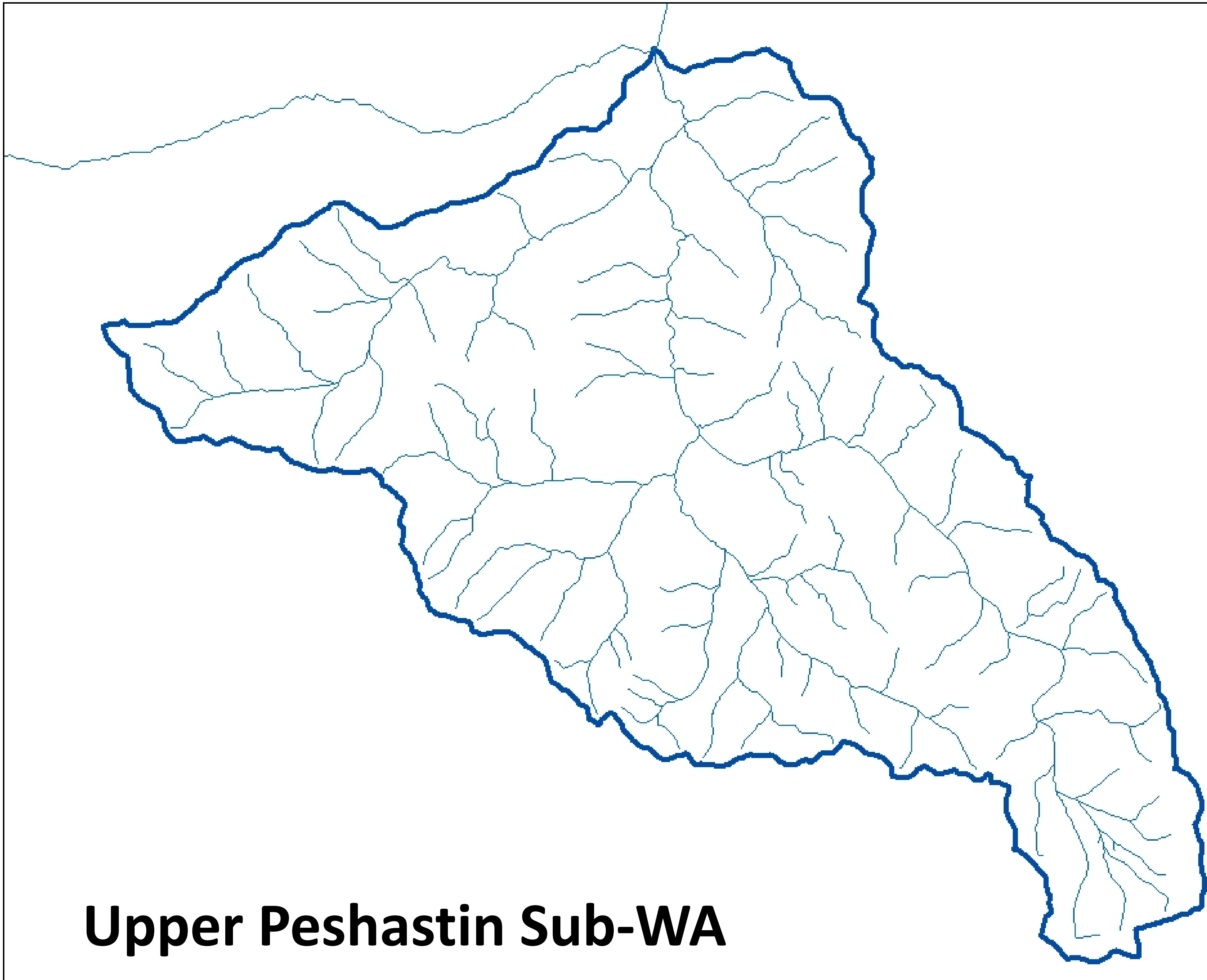
Okanogan-Wenatchee NF: Process Linkage for Whole WA Approach to Restoration



If We Put The Assessment Parameters Together…….

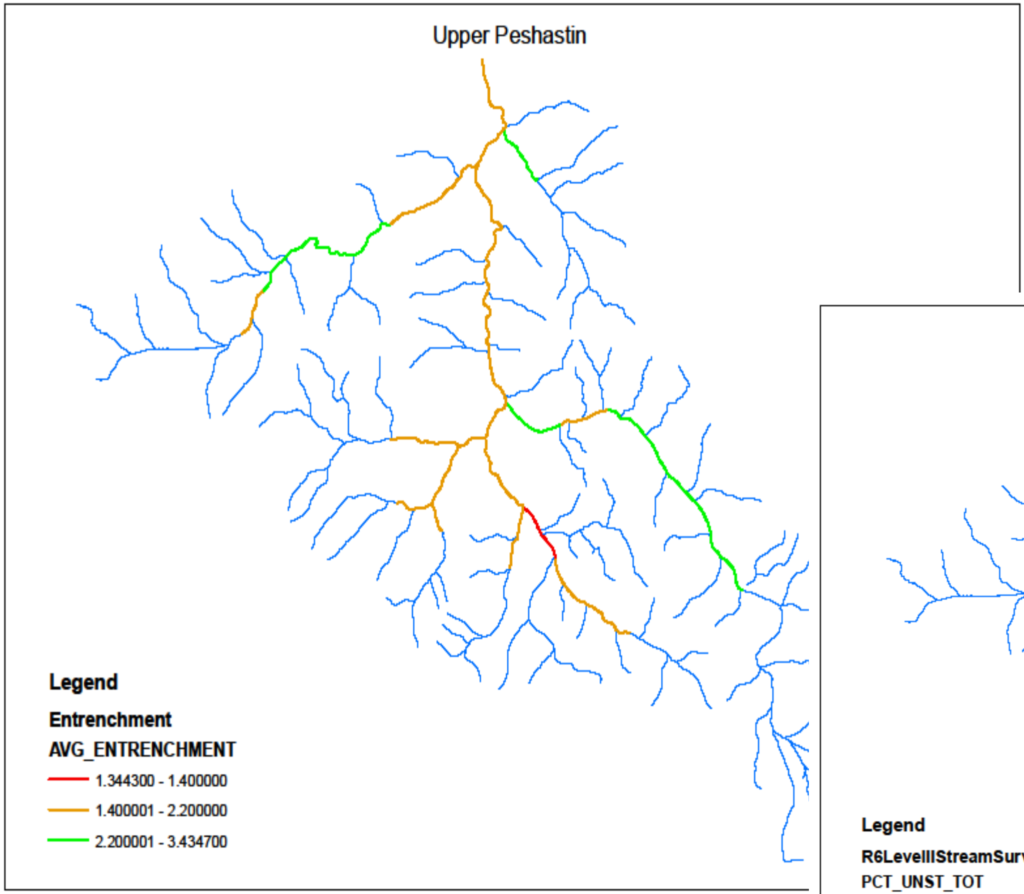
DI = (RN) HG + WQ + BC

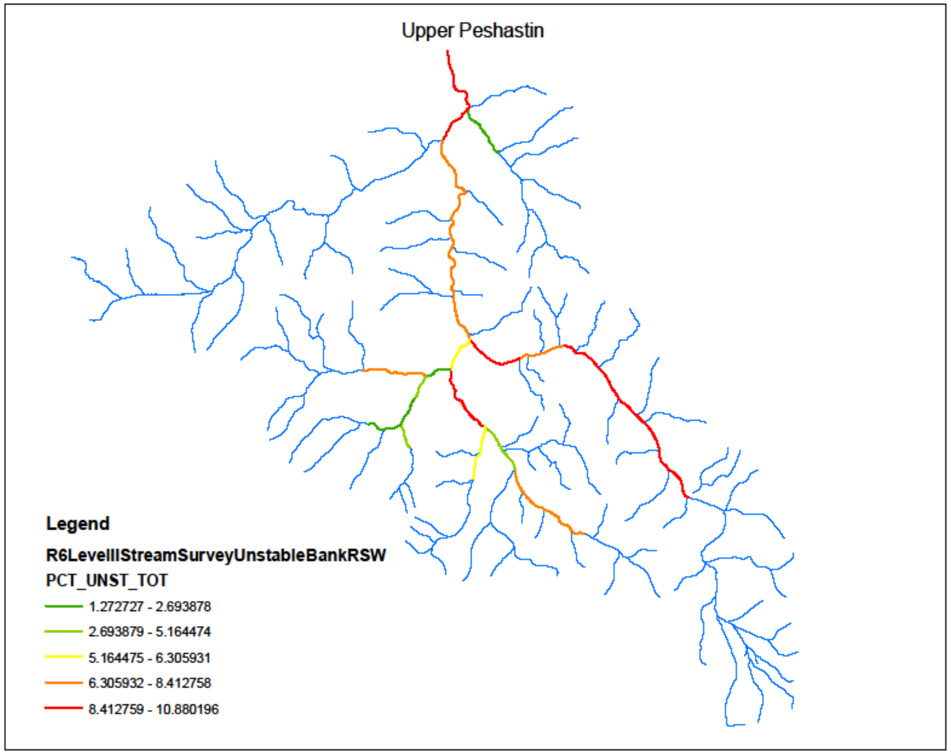
Can We Highlight "1st Cut Areas" Where Data Indicates Roads Are Causing Varying Degrees Of Impairment?



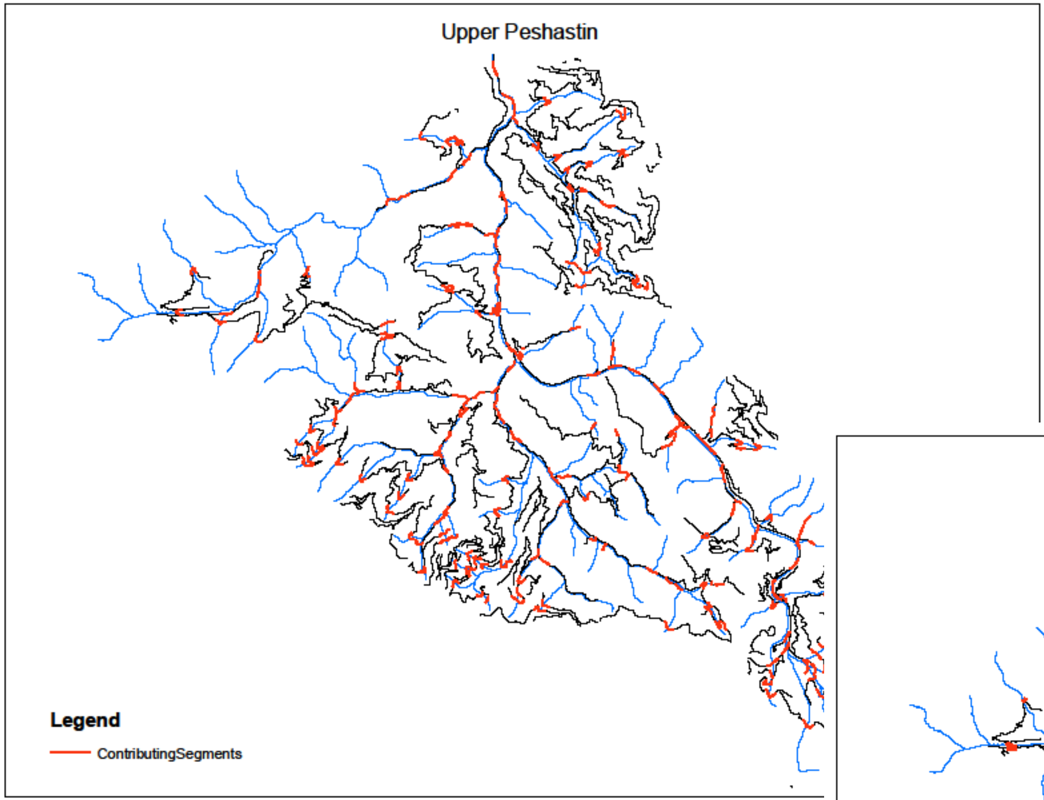
Upper Peshastin Sub-WA

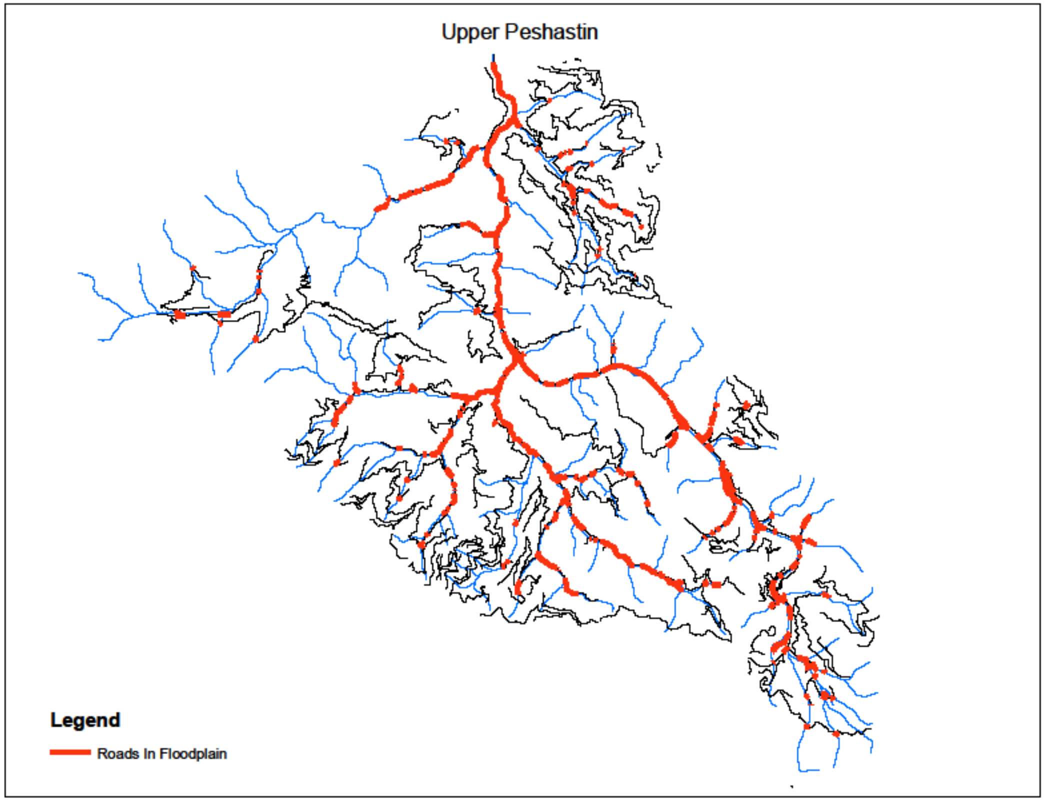
Geomorphic Indicators



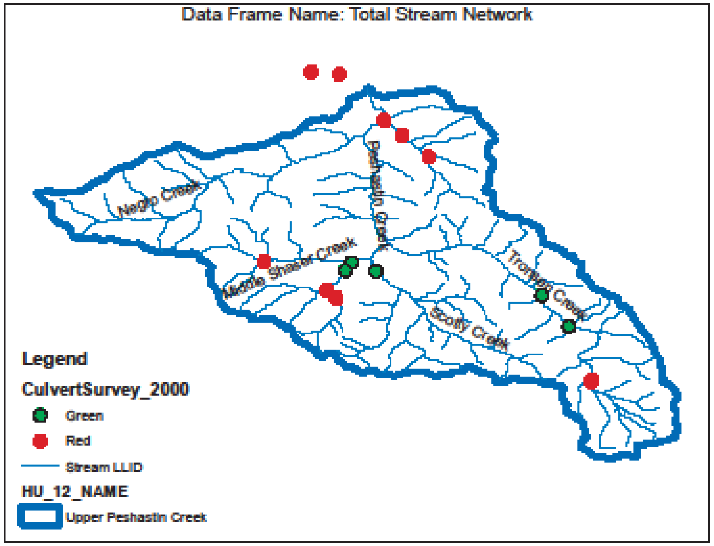


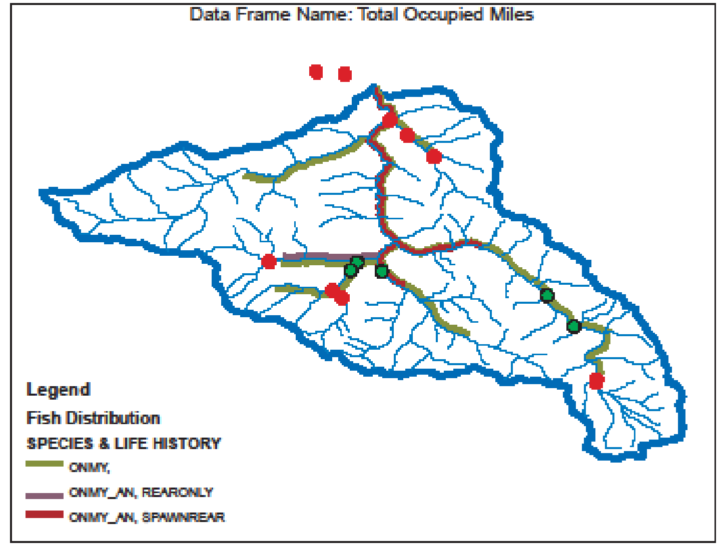
Measures of Causal Mechanisms

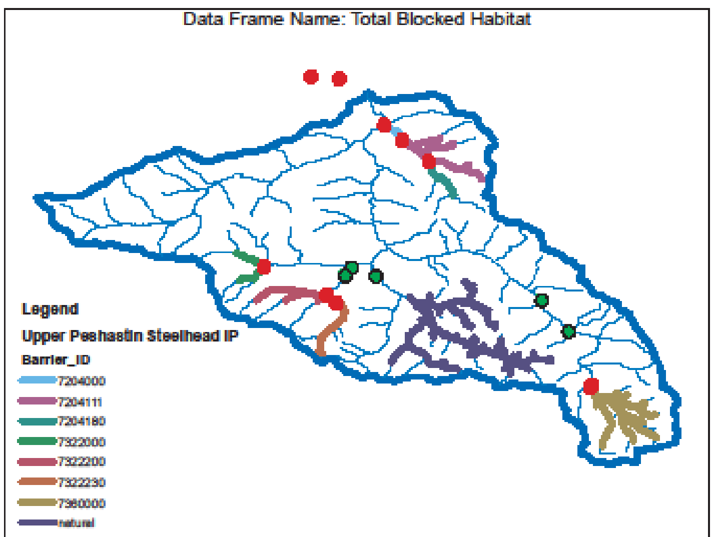


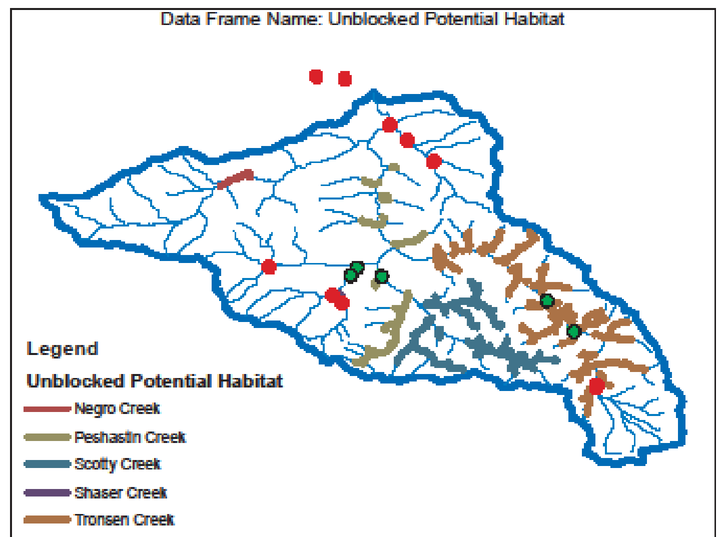


Biologic Condition and Function

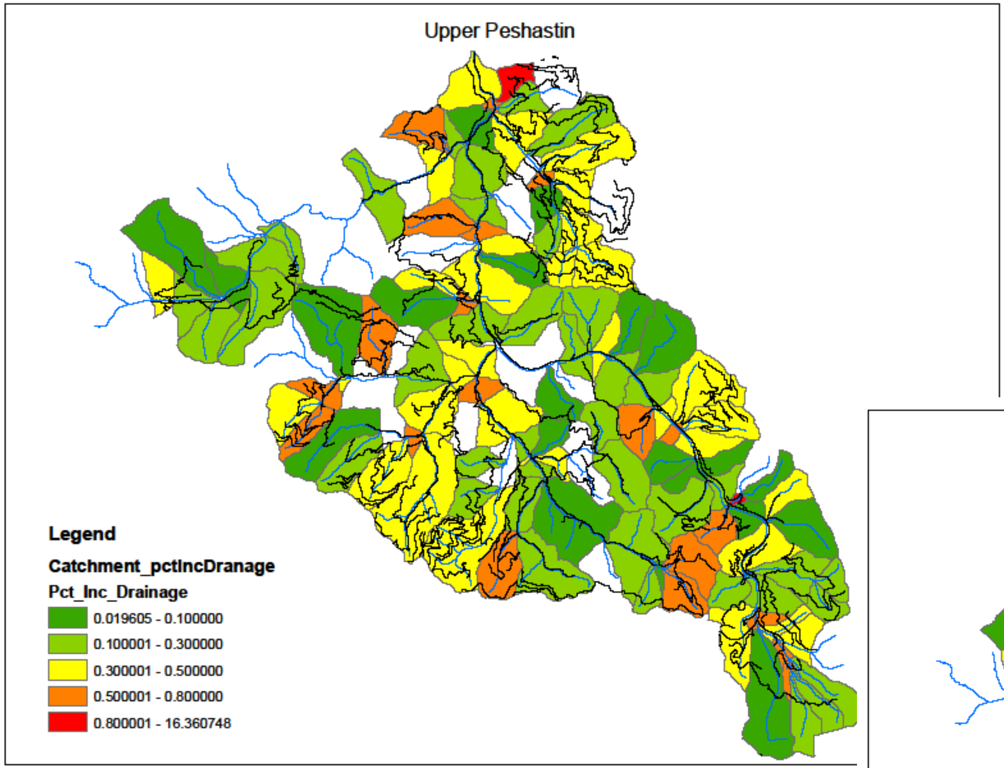


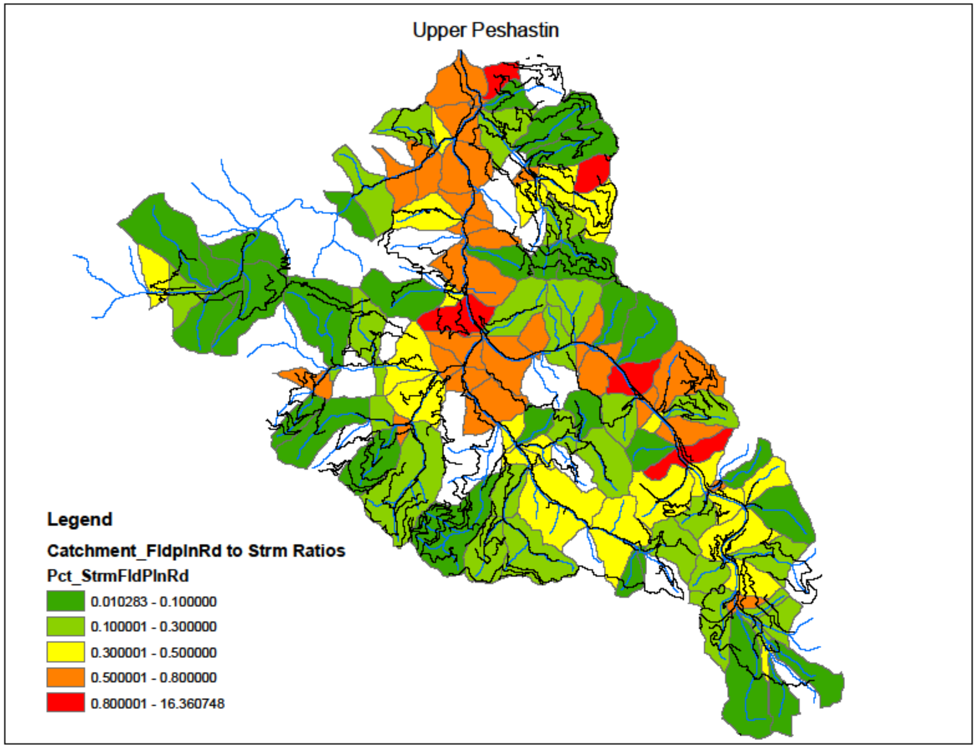






Selection Criteria

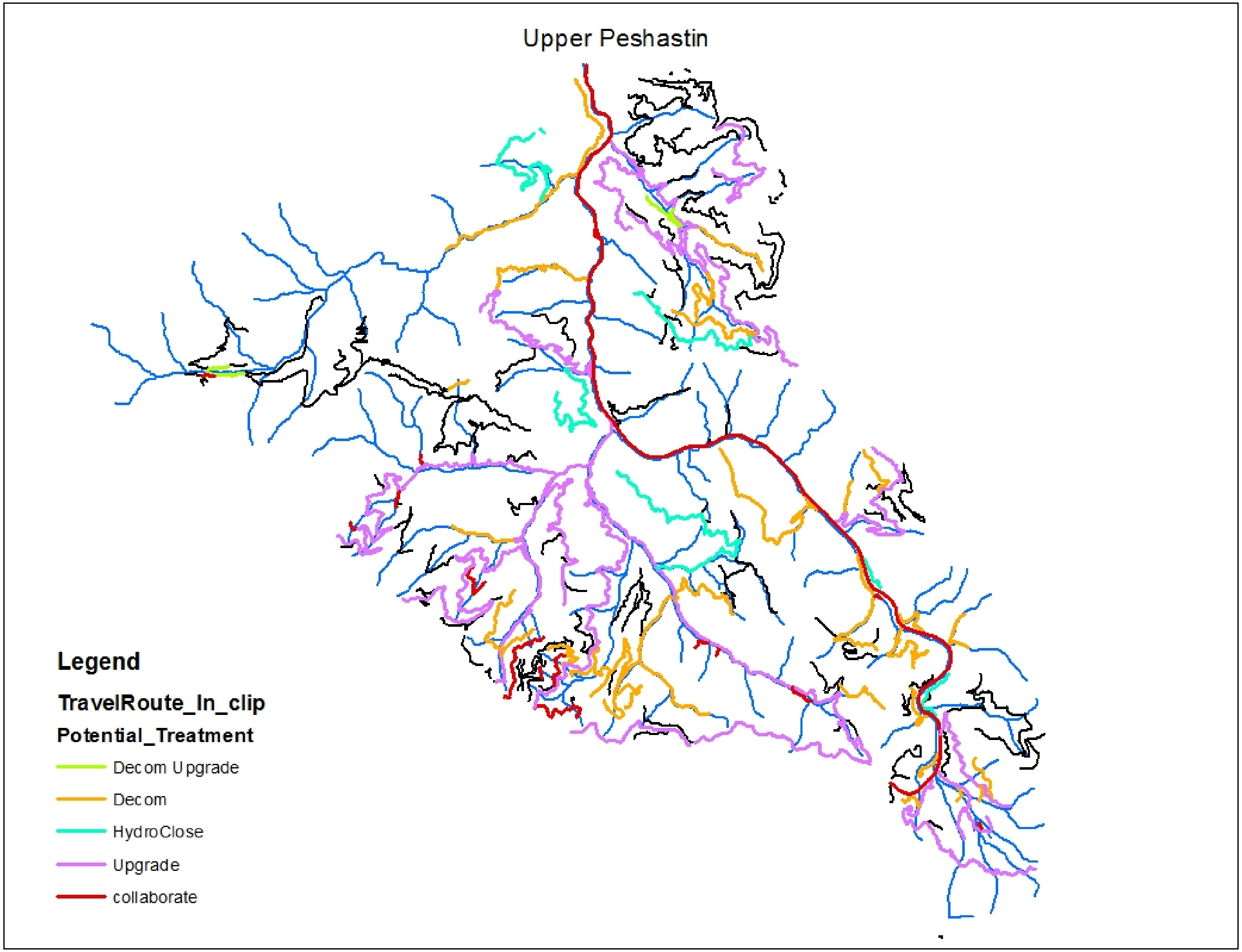




Resulting List of Potential Treatments

RTE_NO	Road_Length	Steelhead_barrier	Chinook_barrier	Bulltrout_Barrier	InCatch_5xing	RdMi_Drain30	RdMi_fldRdratio30	Peshastin_Decom_	**Decom**	**Decom_nonsys**	**Relocate**	**Hydro Close**	**Upgrade**	comments
7201410	4.33					0.29						Hydro	upgrade	Decom 7201411. Check and upgrad
7204000	10.13	Y		Y		1.03	0.05					Hydro	Remove	
7204111	3.38	Y	Y	Y		0.23						Hydro	Remove	Check drainage Crossings, upgrade
7204160	1.99					0.21		Y				Hydro Close	Remove Barriers	upgrade crossings, outslope etc. P from 7201410 road and follow ridg work with pvt.
7204180	1.36	Y		Y		0.25	0.23		Decom		relocate	Hydro	Remove	Upgrade barries. Decom or hydro c
7204181	2.81					0.00	0.17					Hydro Close	Upgrade	Check Crossings at draws. Investig duplicate roads.
7204214	1.72					0.22	0.35		Decom		relocate	Hydro Close		Decom/Hydro close FS portion at a other landowners.
7204231	2.08					0.33			Decom		relocate	Hydro Close	upgrade crossings	Check Crossings to 0.4, decom last decom/relocate in conjuction with from 7204241.
7204241	2.34					0.24			Decom			Hydro Close		Similar to 7204300. Midslope cross draianges and potentially unstable for hydro effects. Stcked with 7204
7204300	3.55					0.19						Hydro Close	upgrade crossings	Crosses headwater draws and pote near end. Check for hydro issues a Potential to Decom 7204250 as it g
7224000	5.33				1	0.72	0.20	Y				Hydro	Upgrade	Upgrade Crossings, outslope etc.
7224111	0.62				4	0.27	0.30	Y	Decom		relocate	Hydro		See Decom EA
7224211	1.29					0.00	0.10	Y	Decom			Hydro		See Decom EA

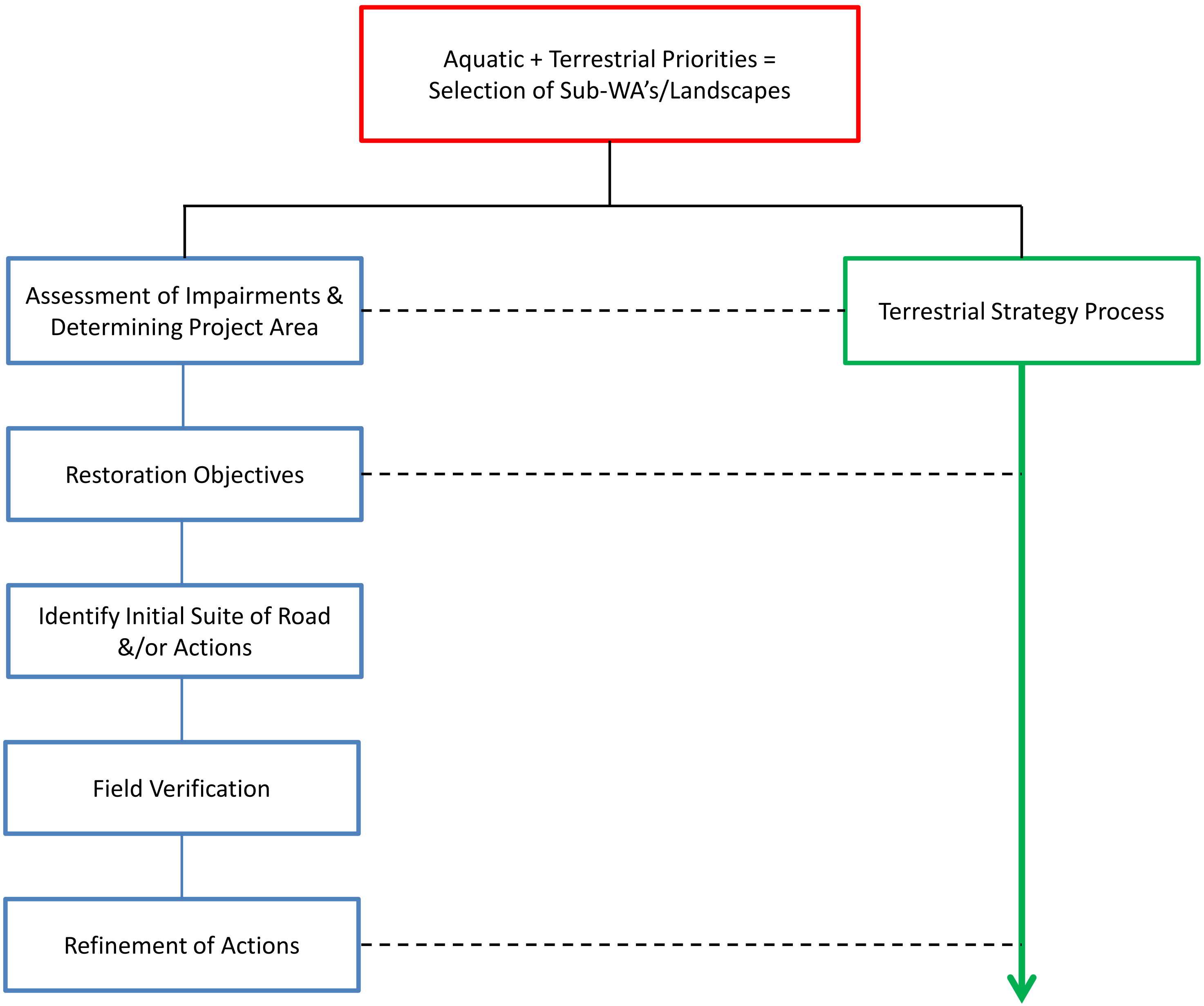
Potential Treatments



The Forest Has Chosen To Work In Most Of The Oka-Wen NF's Priority WA's….

But How Are We Going Make Choices About Sub-WA's/Landscapes To Do Future Management In?

Integration - Opportunities



Stratifying & Prioritizing Sub-WA's Across The Oka-Wen NF

HUC 12	HUC 12 Name	WCF Rating (green = 0) (yellow = 1) (red = 2)	Aquatic Species AEC Score (green = 0) (yellow = 1) (red = 2)	Recovery Plan Focus WA (Yes = 1) (No = 0)
170200080508	Little Bridge Creek	Yellow (1)	Red (2)	No (0)
170200100209	Mills Creek- Entiat River	Yellow (1)	Red (2)	Yes (1)
170200110303	Upper Chiwawa River	Green (0)	Green (0)	Yes (1)
170300010504	Taneum Creek	Yellow (1)	Red (2)	No (0)
171100050304	Devils Creek	Green (0)	Green (0)	No (0)

Scores

Little Bridge Creek *3*
Mills Creek-Entiat River 4
Taneum Creek 3
} Go here first

Upper Chiwawa River 1 } Go here second

Devils Creek 0 -----------> Probably not going to focus much mgt here

Next Steps: Field Verification

Assessment of Impairments → Highlighted Roads of Concern

FIELD – "RAPID VERIFICATION" OF INDICATORS = REFINE PROPOSAL AS APPROPRIATE

	Indicators		
Evaluation Metrics	**Stream Power/Alteration**	**Sediment Sources**	**Biological Function**
%/Length in Floodplains	X	X	X
No. of Drain Points	X	X	
No. of Artificial Channels	X	X	
Length of Artificial Channels	X	X	
Stream Channel Crossing Condition & AOP	X	X	X
Width/Depth Ratio	X	X	X
Entrenchment Ratio	X	X	X

Next Steps

1. Continue to develop method for out-year sub-watershed selection.
2. REFINE & TEST indicator metrics ---------> formulating restoration objectives.
3. Identification of roads at the assessment/restoration objective stage.
4. Finish building the analysis tool.
5. Develop field validation procedure (targeted approach).
6. Where appropriate, refine the process for deciding what to do with problem roads.
7. Move the initial procedures into Little Naches River and Tillicum Creek restoration planning efforts.
8. Continue to interface procedural results with scientists:

    Greg Kuyumjian (Oka-Wen NF)
    Beverley Wemple (Univ. of Vermont)
    Rebecca Flitcroft (PNW Corvallis)
    Terry Craigg (Regional Office post-Doc)
    Charlie Luce (RMRS Boise Science Lab)
    Tom Black (RMRS Boise Science Lab)


QUESTIONS??