Working Hypothesis

Indicators of Stream Attributes Posited to be a components of Indicators of Final Ecosystem Service to Specific User Categories and Subcategories

Human "Use" Categories and Subcategories	Quantity		Quality -- Physical						Quality - Chemical			Quality -- Biological				
	Amount	Timing	Temperature	Stream Hydrologic State	Conductivity/Salinity	Stream Bed/Substrate	Visual Appearance	Sound	Dissolved Oxygen	Chemicals	Odor	Pathogens and Parasites	Fish	Shellfish and Wildlife	Plants	Genetic Diversity
I Agriculture																
a) Irrigated Crops	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) During the growing season 2) During times it would interfere with agricultural operations			Average daily conductivity at all points and times					1) Crop Toxicity during the growing season at all points 2) Toxicity to Crop Consumers during the growing season at all points		Pathogen and parasite abundance by major taxonomic group at all points at all times				
b) Livestock (CAFO)	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations			Average daily conductivity at all points and times					1) Livestock Toxicity at all points and times 2) Toxicity to Livestock Consumers at all points and times		Pathogen and parasite abundance by major taxonomic group at all points at all times				
c) Aquaculture	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations	Maximum, minimum, daily average temperature at all points and times		Maximum, minimum, daily average conductivity at all points and times				Min max and average DO at all points and times	1) Product Toxicity at all points and times 2) Toxicity to Product Consumers at all points and times		Pathogen and parasite abundance by major taxonomic group at all points at all times				
d) Processing	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations	Maximum, minimum, daily average temperature at all points and times		Maximum and average daily conductivity at all points and times					1) Product Toxicity at all points and times 2) Toxicity to Product Consumers at all points and times 3) Compatibility with Plant Operations at all point and times		Pathogen and parasite abundance by major taxonomic group at all points at all times				
e) Grazing	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations		International Scale of River Difficulty at all points during the grazing season	Average daily conductivity at all points and times	Presence of substrate classes at all points and times				1) Livestock Toxicity at all points and times 2) Toxicity to Livestock Consumers at all points and times		Pathogen and parasite abundance by major taxonomic group at all points at all times			Presence and Abundance of Plants that could make livestock sick at any time during the grazing season	
f) Subsistence (extraction of plants or animals)	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations		International Scale of River Difficulty at all points at all times						1) Wild food Toxicity at all points and times 2) Toxicity to wild food Consumers at all points and times		Pathogen and parasite abundance by major Consumers at all points at all times	Presence, abundance, size, gender and condition of native or naturalized consumable fish taxa at each point at all times	Presence, abundance size, gender and condition of native or naturalized consumable taxa at each point at all times	Presence and abundance of consumable native or naturalized plant taxa at each point during the fishing season	
II Industry																
a) Cooling Water	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations	Maximum, minimum, daily average temperature at all points and times		Maximum and average daily conductivity at all points and times					Compatiblity with operations at all points and times			Presence of fish in abundances that foul water intake at any point at any time	Presence of taxa in abundances that foul water intake at any point at any time	Presence of plants in abundances that foul water intake at any point at any time	
b) Processing	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations	Maximum, minimum, daily average temperature at all points and times		Maximum and average daily conductivity at all points and times					Compatiblity with operations at all points and times			Presence of fish in abundances that foul water intake at any point at any time	Presence of taxa in abundances that foul water intake at any point at any time	Presence of plants in abundances that foul water intake at any point at any time	
c) Hydroelectric and other Dams	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations														
d) Extracting (Sand and Gravel)	Flood	During times it would interfere with operations				Presence and abundance of sand and gravel at all points and times										
e) Discharge	Flood	During times it would interfere with operations														
f) Commercial Extraction (e.g. fishing)	Flood	During times it would interfere with operations								Risk of illness to consumer at all points and times		Risk of illness to consumer	Presence, abundance, gender, sizes and condition of commercially relevant native or naturalized consumable fish taxa at each point at any time	Presence, abundance, gender, sizes and condition of commercially relevant native consumable taxa at each point at any time	Presence, gender, abundance, sizes and condition of commercially relevant native or naturalized consumable plant taxa at each point at any time	
g) Pharmaceutical Industry																Organisms with pharmaceutical potential
III Municipal and Residential																
a) Drinking Water Source	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations			Maximum and average daily conductivity at all points and times					1) Compatiblity with plant operations at all points and times 2) Risk of illness at all points and times		1) Pathogen and parasite abundance by major taxonomic group at all points at all times	Presence of fish in abundances that foul water intake at any point at any time	Presence of taxa in abundances that foul water intake at any point at any time	1) Presence of plants in abundances that foul water intake at any point at any time: 2) Presence of toxic plants at any point at any time	

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	Quantity		Quality -- Physical						Quality - Chemical			Quality -- Biological		
b) Subsistence Drinking Water	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations			Maximum and average daily conductivity at all points and times				Risk of illness to consumer at all points and times		Risk of illness			
c) Waste Water Treatment Plant														
d) Property Owners	Flood	Ever		International Scale of River Difficulty at all points at all times		Presence of substrate classes at all points and times	Average daily Color (PCU) and clarity of water; amount of visible open water, visible stream gradient at all points and times	Presence and character of sounds originating from the stream at all points and times		Presence and character of odor originating from the stream at all points and times		Presence of visible native or naturalized fish taxa at each point at any time	1) Presence of dangerous or destructive taxa 2) Presence of visible native or naturalized taxa at each point at any time	Presence of visible native or naturalized taxa at each point at any time
IV Non-Use														
a) Existence	Deviation from Expected Desired or Undisturbed Condition in Velocity, Quantity or Level at all points	?										1) Deviation from Expected, Desired or Undisturbed Condition in Fish Assemblages; 2) Presence of Charismatic Fish	1) Deviation from Expected Desired or Undisturbed Condition in Shellfish or Wildlife Assemblages; 2) Presence of Charismatic Taxa	1) Deviation from Expected Desired or Undisturbed Condition in Plant Assemblages; 2) Presence of Charismatic Taxa
b) Option/Bequest	Expected Future Deviation from Expected Desired or Undisturbed Condition in Velocity, Quantity or Level	?										1) Expected Future Deviation from Expected, Desired or Undisturbed Condition in Fish Assemblages; 2) Expected Future Presence of Charismatic Fish	1) Expected Future Deviation from Expected, Desired or Undisturbed Condition in Shellfish and Wildlife Assemblages; 2) Expected Future Presence of Charismatic Taxa	1) Expected Future Deviation from Expected, Desired or Undisturbed Condition in Plant Assemblages; 2) Expected Future Presence of Charismatic Plant
V Recreational Use														
a) Viewing	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	?		International Scale of River Difficulty at all points at all times			Average daily Color (PCU) and clarity of water; amount of visible open water, visible stream gradient at all points and times	Presence and character of sounds originating from the stream at all points and times				Presence of visible native or naturalized fish taxa at each point at any time	Presence of visible native or naturalized shellfish or wildlife taxa at each point at any time	Presence and abundance visible plant taxa at all points at all times
b) Swimming and wading	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) At any time of potential use 2) During times it would interfere with operations	Maximum, minimum, daily average temperature at all points and times	International Scale of River Difficulty at all points at all times		Presence of substrate classes at all points and times	Average daily Color (PCU) and clarity of water; amount of visible open water, visible stream gradient at all points and times	Presence and character of sounds originating from the stream at all points and times	1) Risk of illness at all points and times 2) Risk to equipment at all points and times	Presence and character of odor originating from the stream at all points and times	Risk of illness	Presence and abundance of dangerous or unpleasant native and naturalized fish during the swimming season at all points	Presence and abundance of dangerous or unpleasant taxa during the swimming season at all points	1) Presence and abundance unpleasant or dangerous plant taxa at all points at all times: 2) Presence of dangerous woody debris at all points and times
c) Fishing and Hunting				International Scale of River Difficulty at all points at all times		Presence of substrate classes at all points and times	Average daily Color (PCU) and clarity of water; amount of visible open water, visible stream gradient at all points and times	Presence and character of sounds originating from the stream at all points and times	1) Risk of illness at all points and times 2) Risk to equipment at all points and times	Presence and character of odor originating from the stream at all points and times	Risk of illness	Presence, abundance, condition, size and gender of recreationally relevant native or naturalized fish taxa at each point at all times	Presence, abundance, condition, size and gender of recreationally relevant native or naturalized taxa at each point at all times	
d) Boating	1) Daily average flow of water and the daily standard deviation over a route 2) Flood	1) ? 2) During times it would interfere with operations	Maximum, minimum, daily average temperature at all points and times	International Scale of River Difficulty at all points at all times			Average daily Color (PCU) and clarity of water; amount of visible open water, visible stream gradient at all points and times	Presence and character of sounds originating from the stream at all points and times	1) Risk of illness at all points and times 2) Risk to equipment at all points and times	Presence and character of odor originating from the stream at all points and times	Risk of illness	Presence, abundance and size of viewable or dangerous native and naturalized fish taxa at all points at all times	Presence, abundance and size of viewable or dangerous native and naturalized taxa at all points at all times	Presence of plants in abundances that inhibit navigation at any point at any time
VI Spiritual														
a) Spiritual and Ceremonial	1) Daily average flow of water and the daily standard deviation at all points for each day 2) Flood	1) ? 2) During times it would interfere with spiritual activities				Presence of substrate classes at all points and times	Color (PCU) and clarity of water at all points and times	Presence and character of sounds originating from the stream at all points and times	1) Risk of illness at all points and times 2) Risk to equipment at all points and times	Presence and character of odor originating from the stream at all points and times		Presence of spiritually significant fish at all points at all times	Presence of spiritually significant taxa at all points at all times	Presence of spiritually significant plant at all points and at all times
VII Commercial Transportation														
a) Goods	1) Daily average flow velocity and depth of water and the daily standard deviation over a route 2) Flood	1) At any time of potential use 2) During times it would interfere with operations		International Scale of River Difficulty at all points at all times										Presence of plants in abundances that inhibit navigation at any point at any time
b) People	1) Daily average flow velocity and depth of water and the daily standard deviation over a route 2) Flood	1) At any time of potential use 2) During times it would interfere with operations		International Scale of River Difficulty at all points at all times			Average daily Color (PCU) and clarity of water; amount of visible open water, visible stream gradient at all points and times	Presence and character of sounds originating from the stream at all points and times						Presence of plants in abundances that inhibit navigation at any point at any time
VIII Education and Research														
a) Education and Research														