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Stressors from relevant recovery plans

These lists of stressors are from the relevant Recovery Plans (with an additional “Research and Monitoring” stressor added to cover certain PA components). Your analysis will determine which stressors are affected by the PA (positive/negative), by separating the action into components (using the deconstructed action figure for your division). For the species analysis focus on how these stressors affect species responses and risk and for critical habitat analysis, focus on how these stressors affect PBFs.

Because many of these stressors are very broad, authors should feel free to discuss more specific types of effects to species or critical habitat within a given stressor category. The final two sections of this document offers some examples of specific effects to species within the stressor categories for CV salmonids (from the July 2014 Recovery Plan) and for green sturgeon (from the August 2018 Recovery Plan). You may (but don’t have to) discuss these specific effects in your “Effects of the PA” sections. There are likely many more specific effects – the examples offered are not intended to be an exhaustive list and authors may discuss any relevant specific effects that apply, whether or not they appear on these lists.

Recovery Plan	Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead	Recovery Plan for the Southern Distinct Population Segment of North American Green Sturgeon (<i>Acipenser medirostris</i>)	Final Recovery Plan for the Southern Oregon/Northern California Coast Evolutionarily Significant Unit of Coho Salmon (<i>Oncorhynchus kisutch</i>)	Endangered Species Act Recovery Plan for the Southern Distinct Population Segment of Eulachon (<i>Thaleichthys pacificus</i>)	Recovery Plan for Southern Resident Killer Whales (<i>Orcinus orca</i>) January 2008
<i>Publication Date</i>	<i>July 2014</i>	<i>August 2018</i>	<i>2014</i>	<i>September 2017</i>	<i>January 2008</i>
To right: Source of list elements Below: Reference number of list element ¹	“Primary Stressor Category” elements (p. 2-56 to 2-57)	Most from “Threat Category” elements from Table 1 (p. 22)	“Stresses” in Table 3-3 (p. 3-4)	“Threats” from Table ES-1 (p. 19)	“Threat” elements from Table 6 (p. II-74)
1	Passage Impediments/Barriers	Passage Impediments/Barriers to Migration	Adverse Hatchery Related Effects	Climate change impacts on ocean conditions	Prey availability
2	Harvest/Angling Impacts	Altered Flow	Impaired Water Quality	Dams/water diversions	Contaminants
3	Water Temperature	Altered Water Temperature	Degraded Riparian Forest	Eulachon bycatch	Vessel effects (commercial, Recreational whale watch)

¹ Not necessarily numbered in source document, but done so here for convenience.

4	Water Quality	Altered Sediments	Increased Disease/Predation/ Competition	Climate change impacts on freshwater habitat	Vessel effects (other vessel traffic not targeting whales)
5	Flow Conditions	Altered Turbidity	Altered Sediment Supply	Predation	Sound
6	Loss of Riparian Habitat and Instream Cover	Take (Entrainment, Poaching & Bycatch)	Lack of Floodplain and Channel Structure	Water quality	Oil spills (pipelines, container and oil tankers)
7	Loss of Natural River Morphology and Function	Contaminants	Altered Hydrologic Function	Catastrophic events	Oil spills (small chronic sources)
8	Loss of Floodplain Habitat	Altered Prey Base	Barriers	Disease	Disease
9	Loss of Tidal Marsh Habitat	Competition for Habitat	Impaired Estuary/Mainstem Function	Competition	Small population size
10	Spawning Habitat Availability	Loss of Wetland Function	Adverse Fishery and Collecting Related Effects	Shoreline construction	Live-captures for aquaria
11	Physical Habitat Alteration (e.g., lack of instream gravel supply, watershed disturbance)	Predation	<i>Other stressor not from Recovery Plan: Didn't add "Research and Monitoring" because I think it can be handled under "collecting related effects".</i>	Tribal/First Nations fisheries	<i>Other stressor not from Recovery Plan: Didn't add "Research and Monitoring" because no research or monitoring proposed for SRKW.</i>
12	Invasive Species/Food Web Changes	Water Depth Modification		Non-indigenous species	
13	Entrainment	Disease		Recreational harvest	
14	Predation	Climate Change		Commercial harvest	
15	Hatchery Effects	<i>Other stressor not from Recovery Plan:</i>		Scientific monitoring	

		Research and Monitoring			
16	Other stressor not from Recovery Plan: Research and Monitoring			Dredging	
17				Other stressor not from Recovery Plan: Didn't add "Research and Monitoring" because I think it can be handled under "Scientific monitoring".	

Example Stressors Table

Mark “X” for affected by components of the PA, or N/A (to indicate which ones will be discussed in the section). Example below shows the CV Salmonid stressors relevant for CV divisions – can make equivalent tables using stressor lists from relevant recovery plan.

Table X-X: Summary of which stressors from the "Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter-run Chinook Salmon and Central Valley Spring-Run Chinook Salmon and the Distinct Population Segment of California Central Valley Steelhead" (NMFS 2014) will be analyzed under each Proposed Action component within this effects analysis for the <list Division>. An “X” indicates the stressor will be analyzed for at least one life-stage and species and an “N/A” indicates that the stressor is not applicable for a particular Proposed Action component.

Primary stressors from Recovery Plan for Central Valley Salmonids	Proposed Action component						
	Component 1	Component 2	⋮				
1. Passage Impediments/Barriers							
2. Harvest/Angling Impacts							
3. Water Temperature							
4. Water Quality							
5. Flow Conditions							
6. Loss of Riparian Habitat and Instream Cover							
7. Loss of Natural River Morphology and Function							
8. Loss of Floodplain Habitat							
9. Loss of Tidal Marsh Habitat							
10. Spawning Habitat Availability							
11. Physical Habitat Alteration							
12. Invasive Species/Food Web Changes							
13. Entrainment/Impingement							
14. Predation							
15. Hatchery Effects							

Other stressors not from Recovery Plan								
16. Research and monitoring								

Example of specific effects within CV Salmonid stressors

1. Passage Impediments/Barriers
 - Flow/temperature-related barriers to migration
 - Temporary barriers
2. Harvest/Angling Impacts (likely N/A)
3. Water temperature (affected by flows)
 - Egg survival
 - Spawning Adult survival
 - Late season juvenile emigration
 - Pathogen risk
4. Water Quality
 - Contaminants (herbicides in CCF)
 - Flow related
5. Flow Conditions (flood releases, pulse flows)
 - Redd scour
 - Redd dewatering
 - Juvenile stranding (fluctuations)
 - Floodplain inundation juvenile growth
 - Travel time affecting survival
 - Routing affecting survival (riverine vs. tidal transition zone, channel junctions [i.e. Georgianna Slough, open DCC gates])
 - Delta survival
 - Upstream survival (Temp related - spawning/egg incubation)
 - Unnatural hydrograph (summer/winter)
6. Riparian vegetation (flows supportive)
 - Geomorphic processes
7. Loss of Natural River Morphology and Function
 - Timing and magnitude of flows
 - River channelization
8. Loss of Floodplain Habitat
 - Yolo
9. Loss of Tidal Marsh Habitat (NA?)
10. Spawning Habitat Availability
 - Funding source for gravel augmentation
 - Temp/flow-related (ops)

11. Physical Habitat Alteration (e.g., lack of instream gravel supply, watershed disturbance)
 - Gravel augmentation, restoration?
 - Barrier installations (creating low channel velocity flows in riverine reaches)
12. Invasive Species/Food Web Changes
 - Food/prey availability
 - Pathogens
13. Entrainment/Impingement at water diversions
 - Entrainment – unscreened CVP/SWP diversions; Impingement – screened CVP/SWP diversions.
14. Predation
 - At CVP/SWP structures
 - flow-related
 - routing-related
15. Hatchery
 - Nimbus hatchery *O. mykiss* spawning with natural-origin steelhead in the American River and in other CV streams

New stressor not from Recovery Plan but may apply to some PA components:

16. Monitoring, Maintenance, Research Studies, etc
 - Capture and handling

Example of specific effects within green sturgeon stressors

1. Passage Impediments/Barriers to Migration
 - Restricted spawning and rearing habitat
 - Inadequate fish passage at weirs, bypasses
2. Altered flow
 - Impoundments limit frequency of high flow events
 - High flow = spawning and migration cue for green sturgeon
 - High water years = high year class recruitment
 - Reduction of pool depths
 - Spawning and rearing habitat for green sturgeon should be >5 m pools
 - Diversion of water
3. Altered water temperature (affected by flow)
 - Eggs and juveniles- development, survival and growth is limited if temp is too low
4. Altered sediments (affected by flow)
 - Impact prey quality and quantity
 - Long-term reduction in turbidity in estuaries
5. Altered Turbidity (affected by flows, sediments)
6. Take
 - Entrainment
 - Water Diversions
 - Screened, impingement- eggs, larvae, juveniles
 - Unscreened, entrainment into ag fields (potentially)
 - Weir overtopping/inadequate fish passage- adults

14. Climate Change

- Increase salinity in Delta and lower Sac
 - Altered prey base; food web productivity
 - High threat to juveniles and adults in SFBDE
 - Declining habitat quality

New stressor not from Recovery Plan but may apply to some PA components:

15. Monitoring, Maintenance, Research Studies, etc

- Capture and handling