

Puget Sound Pressures - Stressor Classification

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These 47 Pressure-Stressors, grouped into 26 stressor categories, have been developed as part of the PSPA project. They represent a modest revision to the PSP 2012 Pressure Taxonomy and have been revised to better capture the most proximate stressors on Puget Sound ecosystems.

Puget Sound Stressors are in **Bold Blue Text** *

**These will be represented as orange factor boxes in Miradi*

<ul style="list-style-type: none"> 1 Habitat conversion due to human land-use change <ul style="list-style-type: none"> 1.1 Conversion of land cover for residential, commercial, and industrial use 1.2 Conversion of land cover for natural resource production 1.3 Conversion of land cover for transportation & utilities 2 Terrestrial habitat fragmentation 3 Shoreline hardening 4 Shading of shallow water habitat 5 Fish passage barriers <ul style="list-style-type: none"> 5.1 Dams as fish passage barriers 5.2 Culverts and other fish passage barriers 6 Barriers to terrestrial animal movement and migration 7 Species disturbance - terrestrial and freshwater <ul style="list-style-type: none"> 7.1 Terrestrial and freshwater species disturbance in human dominated areas 7.2 Terrestrial and freshwater species disturbance in natural landscapes 8 Species disturbance - marine 9 Derelict fishing gear 10 Increased frequency and magnitude of storm flow <ul style="list-style-type: none"> 10.1 Altered peak flows from land cover change 10.2 Altered peak flows from climate change 11 Reduction in base flows <ul style="list-style-type: none"> 11.1 Altered low flows from land cover change 11.2 Altered low flows from climate change 11.3 Altered low flows from withdrawals 12 Flow regulation -- prevention of flood flows 13 Structural barriers to water, sediment, debris flow (including flood flows) <ul style="list-style-type: none"> 13.1 In channel structural barriers to water, sediment, debris flows 13.2 Other structural barriers to water, sediment, debris flows 14 Animal harvest 15 Bycatch 16 Plant Harvest <ul style="list-style-type: none"> 16.1 Timber harvest 	<ul style="list-style-type: none"> 17 Increase in native species <ul style="list-style-type: none"> 17.1 Predation from increased native species 17.2 Displacement by increased native species 18 Introduction of new and/or increase in non-native species <ul style="list-style-type: none"> 18.1 Predation from non-native species 18.2 Displacement by non-natives 18.3 Non-native genetic material 19 Disease and parasite introduction, spread or amplification <ul style="list-style-type: none"> 19.1 Spread of disease and parasites to native species 19.2 Introduction, spread, or amplification of human pathogens 20 Air pollution <ul style="list-style-type: none"> 20.1 Air pollution from mobile sources 20.2 Air pollution from stationary sources 21 Persistent toxic chemicals in aquatic systems <ul style="list-style-type: none"> 21.1 Point source, persistent toxic chemicals in aquatic systems 21.2 Non-point source, persistent toxic chemicals in aquatic systems 22 Non-persistent toxic chemicals in aquatic systems <ul style="list-style-type: none"> 22.1 Point source, non-persistent toxic chemicals in aquatic systems 22.2 Non-point source, non-persistent toxic chemicals in aquatic systems 23 Large spills 24 Conventional water pollutants <ul style="list-style-type: none"> 24.1 Point source conventional water pollutants 24.2 Non-point source conventional water pollutants 24.3 Changes in water temperature from local causes 25 Harmful algal blooms 26 Climate Change <ul style="list-style-type: none"> 26.1 Changing air temperature 26.2 Changing precipitation amounts and patterns 26.3 Sea level rise 26.4 Changing ocean condition
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16.2 Non-timber plant harvest

CODE	NAME	DESCRIPTION	EXAMPLES	PSP A Code
01	Habitat conversion due to human land-use change			A
01.1	Conversion of land cover for residential, commercial, and industrial use	Conversion of land cover to one dominated by residential, commercial, and/or industrial development . This stressor has to do with the reduction in extent and quality of habitat due to conversion. In the terrestrial and nearshore environments sources include residential and commercial development; in the marine environment consider conversion for marinas and other marine uses. Agriculture and aquaculture (see 01.2) and dredging (see 01.3) are assessed separately. Stress associated with disturbance due to human activities (including in developed areas) is addressed separately (see 07). Terrestrial habitat fragmentation (see 02), shoreline hardening (see 03), and barriers to terrestrial animal movement and migration (see 06) are addressed as separate stressors. Pollution impacts are assessed through separate stressors (see 22 through 23). Note that conversion can be step-wise process where, for example, native forest land land is converted to managed forests which are then under stress for further conversion to agriculture or residential and commercial development.		A1
01.2	Conversion of land cover for natural resource production	Conversion of land cover to one dominated by natural resource production such as through agriculture and timber production in terrestrial environments and aquaculture in marine and nearshore environments. This stressor has to do with the reduction in extent and quality of habitat due to conversion. Stress associated with disturbance due to human activities (including in developed areas) is addressed separately (see 07). Terrestrial habitat fragmentation (see 02), shoreline hardening (see 03), and barriers to terrestrial animal movement and migration (see 06) are addressed as separate stressors. Pollution impacts are assessed through separate stressors (see 22 through 23). Note that conversion can be step-wise process		A2

		where, for example, native forest land is converted to managed forests which are then under stress for further conversion to agriculture or residential and commercial development.		
01.3	Conversion of land cover for transportation & utilities	Conversion of land cover to one dominated by transportation and service corridors. This stressor has to do with the reduction in extent and quality of habitat due to conversion, including conversion by dredging. Stress associated with disturbance due to human activities (including in developed areas) is addressed separately (see 07). Terrestrial habitat fragmentation (see 02), shoreline hardening (see 03), and barriers to terrestrial animal movement and migration (see 06) are addressed as separate stressors. Pollution impacts are assessed through separate stressors (see 22 through 23).		A3
02	Terrestrial habitat fragmentation	Division of contiguous habitat into smaller discontinuous patches or different habitat types. Sources of this stressor include development of lands for agriculture, residential, commercial, or industrial uses, or roads and utility corridors. Expressions of this stressor will depend on the endpoint one is assessing. For example, bobcat and certain small passerine birds may have minimum patch size requirements on the order of 25 ha and 3 ha, respectively. Landscapes in which habitat patches are predominantly smaller than these minimums are unlikely to support these species. Disturbance due to human activities (see 07) and habitat conversion (see 01) are evaluated as separate stressors.		B
03	Shoreline hardening	Change of shoreline habitat or features to conditions that reduce habitat extent and/or disrupt shoreline processes. The primary source of this stressor is the construction of shoreline infrastructure that produces a hard linear surface along the beach or stream bank to reduce erosion (e.g., sea walls, revetments, rip-rap, and rock piles). Habitat conversion for residential, commercial and industrial development and other uses is evaluated separately (see 01).		C
04	Shading of shallow water habitat	Decreased light transmitted into shallow waters. This stressor causes species stresses related to productivity or altered predator-prey relationships. The primary source of this stressor is construction of overwater and on-shore structures.		D

05	Fish passage barriers			E
05.1	Dams as fish passage barriers	Dams that block or impede movements and migrations of fish and other aquatic animals. This stressor is intended to evaluate only effects on fish and other aquatic species; effects on flow regulation (see 12) and physical processes (see 13) are evaluated as separate stressors. Fish passage barriers created by culverts and other structures are evaluated as separate stressors (see 05.2).		E1
05.2	Culverts and other fish passage barriers	Structures other than dams that block or impede movements and migrations of fish and other aquatic animals. Includes structures in, along-side, and across water bodies. This stressor is intended to evaluate only effects on fish and other aquatic species; effects on flow regulation (see 12) and physical processes (see 13) are evaluated separately. Fish passage barriers created by dams are evaluated as separate stressors (see 05.1).		E2
06	Barriers to terrestrial animal movement and migration	Structures that block or impede movements and migrations of terrestrial animals such as roads and utility infrastructure. Expressions of this stressor will depend on the endpoint one is assessing. For example for terrestrial species such as elk a strong expression of the stressor may be structures such as multi-lane roads; for avian species a strong expression of the stressor may be energy infrastructure such as wind turbines. Disturbance due to human activities (see 07) and terrestrial habitat fragmentation (see 02) are evaluated as separate stressors.		F
07	Species disturbance - terrestrial and freshwater			G
07.1	Terrestrial and freshwater species disturbance in human dominated areas	Alteration in the feeding, breeding, or resting behaviors of fish or wildlife due to human presence or activities associated with landscapes dominated by man-made structures, such as light and sound disturbances associated with developed areas. Includes artifacts and debris associated with human activities, except pollution impacts are evaluated through separate stressors (see 22 through 23).		G1
07.2	Terrestrial and freshwater species disturbance in natural landscapes	Alteration in the feeding, breeding, or resting behaviors of fish or wildlife and adverse impacts on plant communities due to human presence or activities in more natural landscapes such as disturbance associated with recreation and vehicle traffic on forest roads. Includes artifacts and debris associated with human activities,		G2

		except pollution impacts are assessed through separate stressors (see 22 through 23).		
08	Species disturbance - marine	Alteration in the feeding, breeding, or resting behaviors of marine birds, fish, or other aquatic species due to human presence or activities (e.g., recreation, vessel traffic, military exercises) or artifacts and debris associated with activities except pollution impacts (see 22 through 23) and derelict fishing gear (see 09) are assessed through separate stressors.		H
09	Derelict fishing gear	Mortality associated with entanglement in abandoned nets and other fishing gear.		I
10	Increased frequency and magnitude of storm flow			J
10.1	Altered peak flows from land cover change	Altered peak flows into and in surface waters related to changes in land cover and the associated surface hardening and associated impacts such as changes in sediment and debris delivery. Stress from pollution impacts is evaluated separately (see 22 through 23). Altered peak flow from climate change is evaluated separately (see 10.2)		J1
10.2	Altered peak flows from climate change	Altered peak flows into and in surface waters related to changes in precipitation volume and timing due to climate change and associated impacts such as changes in sediment and debris delivery. Stress from pollution impacts is evaluated separately (see 22 through 23). Altered peak flow from land cover change is evaluated separately (see 10.1).		J2
11	Reduction in base flows			K
11.1	Altered low flows from land cover change	Reduction of low flows in surface waters related to changes in land cover and the associated surface hardening and changes in hydrology. Other reductions of low flows are evaluated separately (see 11.2 and 11.3)		K1

11.2	Altered low flows from climate change	Reduction of low flows in surface water related to changes in precipitation volume and timing due to climate change resulting in reduced glacial coverage and snow pack and/or changes in the timing and rate of snow melt. Other reductions of low flows are evaluated separately (see 11.1 and 11.3)		K2
11.3	Altered low flows from withdrawals	Reduction of low flows in surface waters related to water withdrawals for human use and consumption. Other reductions of low flows are evaluated separately (see 11.1 and 11.3)		K3
12	Flow regulation -- prevention of flood flows	Modification of flood flows by flow regulation in river and stream systems. Sources of this stressor are the impoundment of water by dams and the operation of dams for flood control and/or hydroelectric power production. These structures may also be barriers to movement and migration of fish and aquatic animals, this is evaluated separately (see 05.1).		L
13	Structural barriers to water, sediment, debris flow (including flood flows)			M
13.1	In channel structural barriers to water, sediment, debris flows	Structures that block or restrict movement of water, sediment, or debris flow in the river or stream channel and associated impacts such as changes in sediment and debris delivery. These structures may also be barriers to movement and migration of fish and aquatic animals, this stress is evaluated separately see 05.2. Impacts associated with dams also are evaluated separately (see 05.1 and 12).		M1
13.2	Other structural barriers to water, sediment, debris flows	Structures that block or restrict movement of water, sediment, or debris flow into the floodplain, such as levees and associated impacts such as changes in sediment and debris delivery. These structures may also be barriers to movement and migration of fish and aquatic animals, this stress is evaluated separately see 05.2. Impacts associated with dams also are evaluated separately (see 05.1 and 12).		M2
14	Animal harvest	Removal of fish, invertebrates, or wildlife for human use. This stressor includes intentional harvest or removals only and is meant to assess the effect of intentional harvest on species. Sources of this stressor include fishing, hunting, and collections in support of species' management or investigation. Stress from bycatch is evaluated separately (see 15). Stress from disturbance associated with harvest activities also is		N

		evaluated separately (see 07.2).		
15	Bycatch	Removal of non-target species of fish, invertebrates, or wildlife caught during commercial or recreational fishing.		O
16	Plant Harvest			P
16.1	Timber harvest	Removal of timber for human use. The strong expression of this stressor is clear cutting. Stress from harvest of other types of plants is evaluated separately (see 16.2). Stress associated with disturbance is evaluated separately (see 07.2).		P1
16.2	Non-timber plant harvest	Removal or harvest of non-timber plants, including mushrooms, floral greens, food plants, algae, and aquatic plants, for human use. Stress from timber harvest is evaluated separately (see 16.1). Stress associated with disturbance is evaluated separately (see 07.2).		P2
17	Increase in native species			Q
17.1	Predation from increased native species	Increased predation resulting from the increase / spread of native fish, wildlife, invertebrates, and/or plants. Includes increased predation from synanthropic species such as corvids, gulls, cowbirds, raccoons, and native species from hatcheries.		Q1
17.2	Displacement by increased native species	Displacement and/or decrease in abundance or decrease in population growth rates resulting from the increase/spread of native fish, wildlife, invertebrates, and/or plants. Includes displacement by synanthropic species such as corvids, gulls, cowbirds, raccoons, and native fish species released from hatcheries.		Q2
18	Introduction of new and/or increase in non-native species			R
18.1	Predation from non-native species	Increased predation resulting from the addition or increase of non-native fish, wildlife, domestic animals and pets, invertebrates, and/or plants.		R1

18.2	Displacement by non-natives	Displacement and/or decrease in abundance or decrease in population growth rates resulting from the addition or increase of non-native fish, wildlife, domestic animals and pets, invertebrates, and/or plants.		R2
18.3	Non-native genetic material	Introduction and spread of extra or new genetic material that includes transgenetic material introduced through a variety of genetic engineering methods and purposes (for example, genetically modified agricultural crops), intentional or unintentional hybridization of different species because of management actions, and hybridization of introduced, exotic shellfish or fish with native forms through aquaculture.		R3
19	Disease and parasite introduction, spread or amplification			S
19.1	Spread of disease and parasites to native species	Introduction, spread, or amplification of disease or parasites from human and animal waste, aquaculture, or non-native species to native species. This is meant to assess the effects of diseases and parasites that affecting species other than humans; diseases affecting humans is evaluated separately (see 19.2).		S1
19.2	Introduction, spread, or amplification of human pathogens	Introduction, spread, or amplification of disease-causing or parasitic organisms to humans. Sources of this stressor include release human and animal waste. This is intended to evaluate effects on humans due to, for example, degradation in water quality and the associated degradation in the quality of aquatic species, such as shellfish, consumed by people.		S2
20	Air pollution			T
20.1	Air pollution from mobile sources	Presence or loading of chemicals or particles in the atmosphere that can cause discomfort, disease, or death to humans and harm the natural environment, (including via deposition to land and water) resulting from mobile sources such as car, truck, and vessel traffic. Noise and light pollution are evaluated separately (see 07.1).		T1
20.2	Air pollution from stationary sources	Presence or loading of chemicals or particles in the atmosphere that can cause discomfort, disease, or death to humans and harm the natural environment, (including via deposition to land and water) resulting from stationary sources such as industrial and commercial emissions. Noise and light pollution are evaluated separately (see 07.1).		T2

21	Persistent toxic chemicals in aquatic systems			U
21.1	Point source, persistent toxic chemicals in aquatic systems	Presence or loading of persistent toxics from point sources. Sources of this stressor include activities that generate wastewater that is discharged from municipal and industrial sewers and treatment plants. Include stress from persistent chemical cycling here (e.g., PCB and Hg cycling). Stress from non-point sources is evaluated separately, see 21.2.		U1
21.2	Non-point source, persistent toxic chemicals in aquatic systems	Presence or loading of persistent toxics from non-point sources, such as runoff from developed areas and roads, including from historic (legacy) sources and small (less than 10 gallons) spill events. Sources of this stressor include activities that contribute pollutants to surface water runoff, including that discharged through stormwater conveyance systems. Stress from point sources is evaluated separately, see 21.1.		U2
22	Non-persistent toxic chemicals in aquatic systems			V
22.1	Point source, non-persistent toxic chemicals in aquatic systems	Presence or loading of non-persistent toxics from point sources, including historic sources and small spill (less than 10 gallons) events. Sources of this stressor include activities that generate wastewater that is discharged from municipal and industrial sewers and treatment plants. Stress from non-point sources is evaluated separately (see 22.2).		V1
22.2	Non-point source, non-persistent toxic chemicals in aquatic systems	Presence or loading of non-persistent toxics from non-point sources, such as runoff from developed areas and roads, including from historic (legacy) sources and small (less than 10 gallons) spill events. Sources of this stressor include activities that contribute pollutants to surface water runoff, including that discharged through stormwater conveyance systems. Stress from point sources is evaluated separately (see 22.1).		V2
23	Large spills	Spills of large amounts of oil & hazardous substances, greater than 100 gallons. Sources include large oil spills from large events related to vessels (including derelict vessels), road and rail traffic, pipelines, and industrial facilities. Stress from smaller more routine spills and releases such as those that might occur at gas stations and marinas is evaluated separately (see 21 and 22).		W

24	Conventional water pollutants			X
24.1	Point source conventional water pollutants	Presence or loading of nutrients, sediment, turbidity and oxygen demanding substances from point sources. Sources of this stressor include activities that generate wastewater that is discharged from municipal and industrial sewers and treatment plants. Stress from non-point sources (see 24.2) and temperature changes (see 24.3) are evaluated separately.		X1
24.2	Non-point source conventional water pollutants	Presence or loading of nutrients, sediment, turbidity and oxygen demanding substances from non-point sources. Sources of this stressor include activities that contribute pollutants, including that discharged through stormwater conveyance systems. Stress from point sources (see 24.1) and temperature changes (see 24.3) are evaluated separately.		X2
24.3	Changes in water temperature from local causes	Changes in water temperature. Changes in temperature of marine water from human-caused climate change (see 26.4) is evaluated separately.		X3
25	Harmful algal blooms	Presence of biological and chemical agents associated with blooms of algae in marine and freshwater systems.		Y
26	Climate Change	Environmental stressors associated with increased gas concentrations in atmosphere.		
26.1	Changing air temperature	Changes in air temperature resulting from increased greenhouse gas concentrations in atmosphere. This is a proximate agent on terrestrial species and a source of other stressors. Stress associated with changing water temperature (see 24.3) and changes in air temperature associated with the built environment (see 07.1) are evaluated separately.		Z
26.2	Changing precipitation amounts and patterns	Changes in amount, form, and quantity of precipitation. This is a proximate agent on terrestrial systems and species but an indirect influence (e.g., via altered flows) on other endpoints and a source of other stressors. Changes in peak (see 10) and base (see 11) flows associated with changing precipitation are evaluated separately.		AA
26.3	Sea level rise	The rise in sea level in Puget Sound related to human-induced climate change.		BB

26.4	Changing ocean condition	Changes in water temperature, patterns and magnitude of upwelling events, nutrient and oxygen levels, and decrease in pH of Puget Sound waters related to increased greenhouse gas concentrations in the atmosphere and human-induced climate change.		CC
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