TABLE 4-1: POTENTIAL NO NET LOSS INDICATORS for SHORELINE MASTER PROGRAMS					
Indicator (all in shoreline jurisdiction)	**Functions affected – key categories – water quality, water quantity and habitat**	**Type of Impairment****	**Limitations of indicator**	**Where**	**Is data available or reasonable to obtain**
Forest cover: Acres converted from forest land to other land uses.	Water quality–sediment, nutrients & toxic filtration, conversion, and/or retention; temperature regulation. Water quantity–flow regulation. Habitat-structure for habitat life needs; input of organics & LWM*.	Reduces forest buffers and decreases filtering, conversion, and/or retention of pollutants from surface & subsurface flow; increases quantity of pollutants to aquatic habitats. Alters the delivery and timing of water to aquatic areas, increasing quantity of water delivered to aquatic habitats during high and low flows, which affects habitat structures. Increases water temperature. Loss of nesting sites, rearing, refuge & foraging areas.	Doesn't identify future land use. May be difficult to determine acres in shoreline jurisdiction without finer scale analysis.	Rural.***	Details of application available from DNR and local government. Class IV forest practice applications. CCAP data.
Shoreline stabilization: Linear length or area of bulkheads, revetments, bioengineering, seawalls, groins, retaining walls, gabions. (Includes decrease in length, change to soft structure.)	Habitat-Riparian and aquatic habitat, sediment supply. Input of organics, prey base, & LWM. Structure for habitat life needs.	Interrupts habitat-forming processes, such as beaches & channel migration, by impacting sediment supply and transport. Loss of nesting sites, rearing, refuge & foraging areas. Loss of prey base with associated loss of riparian vegetation.	Combines different types of stabilization measures into one general category; impacts may vary.	Rural, urban.	Is data available from local government, including permits & SDP exempt projects? Can locals track over time? HPA information can supplement other data, but is not sufficient on its own. Detailed aerial photos may also show stabilization changes.

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Marine & freshwater riparian vegetation: Linear measurement of mature native riparian vegetation of a given width (buffer width) or percent cover of different vegetation classes.	Water quality–sediment, phosphorus & toxic filtration, conversion, and/or retention; temperature regulation. Water quantity–flow regulation. Habitat-input of organics, prey base, & LWM. Structure for habitat life needs.	Removes capacity of riparian vegetation to filter surface flows, sediment, phosphorous and toxics; subsurface removal or conversion of nitrogen, pathogens. Increases overland and subsurface flows. Increases water temperature. Reduces prey base. Loss of LWM that provides instream structure. Loss of nesting sites, rearing, refuge & foraging areas.	No permit, so no record of change. Focused project needed to track. Useful only if a baseline exists. Methodology needs to be able to measure change. May be difficult to measure over short time frame.	Rural, urban.	Can locals measure and track? Use sample areas, aerial photos. Puget Sound LIDAR consortium has some data.
Acres of permanently protected areas, with no or limited development: Public ownership, current use/PBRS, conservation easements, fee ownerships, NGOs.	Water quality–sediment, phosphorus & toxic filtration, conversion, and/or retention; temperature regulation. Water quantity-flow regulation. Habitat- Riparian and aquatic habitat, sediment supply. Input of organics, prey base, & LWM. Structure for habitat life needs.	Loss of nesting sites, rearing, refuge & foraging areas.	How measure degree of protection? Limit to protected areas with no development? Difficult to connect with specific functions.	Rural, urban.	Need info on ownership, PBRS, easements. Other info available from county auditor and assessor? Land trusts. NRCS and state agencies are also sources for permanently protected lands.

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Piers/docks/floats, overwater structures: Number of structures, square footage of new and replacement. Or track grating, piling, construction materials.	Habitat. Water quality-toxics.	Increase in predation, reduction in light and aquatic vegetation and simplification of food web.	All docks not same – i.e. grating, materials vary, location affects impacts. New docks partially mitigate impacts.	Rural, urban.	Is data available from local government, including permits and SDP exempt projects? Can locals track over time? Use DNR data – number of and area over water. HPA information can supplement other data, but is not sufficient on its own. Good to monitor late spring/early summer.
Road lengths (feet) within 200 feet of water body.	Water quantity. Water quality. Habitat- connectivity.	Intercepts and changes timing of flows to aquatic habitat. Increases sediment and toxics.	Is there much new road development in shoreline jurisdiction?	Rural, urban.	Data available from DNR, local governments and WSDOT. CCAP data needs analysis to provide relevant information.
Number of road crossings of water bodies -bridges, culverts.	Habitat - Instream functions. Water quality.	Simplifies stream habitat structure, increases channel confinement and interrupts habitat forming processes. Increases delivery of pollutants.	Is there much new road development in shoreline jurisdiction? Distinguishing between fish friendly crossings and others. Combining broad range of activities.	Rural, urban.	Culvert inventories vary in quality. WDFW has fish passage barrier data, but it is incomplete. Remote sensing data? SHIAPP data? CCAP data needs analysis to provide relevant information.
Water quality: 303(d) list. All water quality	Water quality.	Impairment is specific to type of listed 303(d) issue (e.g. increased temperature, low dissolved oxygen,	How relate to functions? Some impacts from outside shoreline jurisdiction. Only	Rural, urban.	Accessible data from Ecology. Is water body on or off list? In some cases, only a portion (e.g., reach)

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parameters such as temperature, dissolved oxygen, fecal coliform, heavy metals, toxics, organics and biological indices (e.g., Biological Index of Biotic Integrity).		increased fecal coliform, heavy metals and toxic organics.)	impaired waters are listed & measured; no WQ improvement project in place. No criteria to remove from list. Sampling methodology changes, not always comparable. Marine & fresh water lists updated in alternating 2-year cycles.		of a water body is listed. 303(d) – comprehensive,
Shellfish listings closures.			Some impacts from outside shoreline jurisdiction and municipality. Emergency closures updated regularly. Uneven data. Changes may be too frequent for NNL purposes. Limited to fecal coliform. Reflects impacts on human health, not shellfish health.		Dept of Health Shellfish Program.
Levees/dikes: Linear feet, floodplain area gained from levee setbacks.	Water quality –sediment removal, temperature regulation. Water quantity–water	Impairs natural flooding regime. Reduces floodplain sediment retention, denitrification and	Can change in habitat quality as a result of levee/dikes be easily measured?	Rural, urban.	Measure increase/decrease in lineal feet, quality of levee related to riparian

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	storage, flooding. Habitat–structure for habitat life needs (e.g., low LWM, stream bed aggradation, river mouth progradation).	hyporheic functions. Decreases groundwater storage and base flows. Interferes with formation of habitat structure such as distributary channels in tidal and riparian and in-channel and off-channel habitat in freshwater settings. Removes habitat structure for nesting, rearing, refuge and foraging.	Various types and locations of levees & dikes are lumped together. Types of openings in levees and dikes vary; impacts may vary.		vegetation & slope. Is data from local governments or FEMA?
Floodplain area: Acres allowed to flood –tidal and river (lack of flood control and lack of other structures such as houses.)	Water quality – removal of toxics, sediment, phosphorous and pathogens through adsorption, filtration and retention. Removal of nitrogen through denitrification. Temperature regulation. Water quantity – water storage and flow regulation and reduction in downstream flooding. Habitat - formation of habitat structure from LWM, vegetation communities and sediment type/channel configuration that support habitat life	Impairment similar to that for levees & dikes with loss of floodplain from diking & filling.	Availability of data, maintenance of data.	Rural, urban.	Do local governments measure this for shoreline inventory? FEMA floodplain info available.

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	needs. Input of organics and prey base.				
Number of bald eagle & osprey nests & roosts & great blue heron rookeries.	Habitat – structure for habitat life needs.	Indicator of impaired habitat.	More suitable for counties than cities.	Rural.	WDFW data – most up-to-date for eagles.
Percent cover of invasive species in riparian zones.	Habitat – Riparian and aquatic habitat, sediment supply. Input of organics & LWM. Structure for habitat life needs.	Overwhelms native plants, compromising ecosystem. Potential effect on physical structure and food web dynamics.	Requires field work. May be useful if data set is available. Use Noxious Weeds list to define invasive species?	Rural, urban.	Is data available? Conservation districts? WA Invasive Species Council? (working on baseline assessment due in May 2011)
Impervious surface area.	Water quality – removal of toxics, sediment, phosphorous and pathogens through adsorption, filtration and retention. Removal of nitrogen through denitrification. Temperature regulation. Water quantity – water storage and flow regulation and reduction in downstream flooding. Habitat - formation of habitat structure from LWM, vegetation communities and sediment	Reduces vegetative buffers and decreases filtering of pollutants from surface & subsurface flow. Alters the delivery and timing of water to aquatic areas, increasing quantity of water and pollutants delivered to aquatic habitats during high and low flows, which affects habitat structure. Increases water temperature Reduces prey base (by	Covered by other indicators? Percentage increase in developed urban areas would be small and may not be useful indicator. Some land surface cover layers are inaccurate, e.g. showing impervious for clearcut forest.	Urban	Aerial photos or other remote sensing techniques show impervious cover. Local governments require new impervious information in permit applications.

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	type/channel configuration that support habitat life needs. Input of organics.	associated removal of vegetation) Loss of nesting sites, rearing, refuge & foraging areas.			
Wetlands acreage: Fill of natural wetlands and constructed or engineered wetlands. This includes nearshore tidal estuaries.	Water Quality – Wetlands filter pollutants and store sediment. Water Quantity – Affect groundwater storage and flow regulation. Habitat – Affects habitat structure, results in loss of wetland vegetation communities that support habitat life needs.	Changes to natural hydrological, chemical, and physical regimes affect the production and succession of a wetland's ecology, and therefore its functions and values.	Difficult to track. Could be covered in other indicators (impervious surface and water quality), however other indicators don't get at wetland conversion to non-impervious land use such as landscaping or agriculture. May require field work.	Rural, urban	Is data available? Local permit tracking? Ecology? Core of Engineers?
Area of seagrasses, kelp and emergent aquatic vegetation.	Habitat – structure for habitat life needs, including food and shelter for many species.	Decreases in aquatic vegetation such as eelgrass and kelp results in loss of food and shelter for many species.	Multiple factors affect growth and sustainability of aquatic vegetation.	Aquatic	Seagrass, kelp and emergent aquatic vegetation data along shoreline available from DNR Shorezone. (1994-2000) More recent local data available at those sites that are among the stratified randomly sampled sites.

* LWM – Large Woody Material

** For some indicators, decreasing the length or area of the indicator would result in a benefit to shoreline functions (e.g., shoreline stabilization, piers & docks.) For other indicators, increasing the length or area of the indicator would result in a benefit to functions (e.g. forest cover, riparian vegetation.)

*** Rural includes rural residential, agricultural and forestry areas.

CCAP – Coastal Change Analysis Program

PBRS – Public Benefit Rating System

NGO – Non-government organization

NRCS – National Resource Conservation Service