

Appendix D

Complete list of risks, strategies, and actions identified and prioritized for the Climate Change Vulnerability Assessment and Adaptation Strategy for Tillamook Estuaries Partnership

1. Multiple species, including coho and Chinook, negatively affected by increased scouring of redds (salmon spawning nests), displaced juveniles, and loss of juvenile refuge areas

TEP goal affected: Assess, protect, and enhance instream habitat

Near term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat improvement	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High
	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	All	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of restoration projects via monitoring	All	High	High	High
	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of big restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		All	Medium	High	Medium
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade	Biodiversity and habitat	Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Land-owners, Local governments (municipal, county)	High	High	Low

2. Change in distribution and survival of native aquatic organisms, including invertebrates, amphibians, and native fish

TEP goal affected: Assess, protect, and enhance instream habitat

TEP goal affected: Assess, protect, and enhance instream habitat

Near term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	ALL	Medium	Medium	High
Habitat improvement	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	ALL	High	High	High
	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	ALL	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	ALL	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of restoration projects via monitoring	ALL	High	High	High
	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private land-owners USFW, ODFW, NOAA, ODA, OWRD (Water Resources Department)	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		ALL	Medium	High	Medium
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade	Biodiversity and habitat	Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Land-owners, Local governments (municipal, county)	High	High	Low

3. Broadening and subsequent contraction of fish distribution may leave fish stranded in disconnected pools or vulnerable to predation

TEP goal affected: Assess, protect, and enhance instream habitat

Near term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat improvement	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High
	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	All	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts btwn conservation, development, other land uses, permits	All	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of restoration projects via monitoring	All	High	High	High
	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		ALL	Medium	High	Medium
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade	Biodiversity and habitat	Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Land-owners, Local governments (municipal, county)	High	High	Low

4. Native salmonids and other aquatic species negatively affected by disease

TEP goal affected: Assess, protect, and enhance instream habitat

Near term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				USFWS, ODFW, NOAA			

5. Impacts to all ages of salmonids, from warmer water, causing population declines

TEP goal affected: Reduce instream temperatures to meet salmonid requirements

Near term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat improvement (to maintain or reduce temps)	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High
	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	All	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of big restoration projects via monitoring	All	High	High	High
	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of big restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		All	Medium	High	Medium
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade		Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Land-owners, Local governments (municipal, county)	High	High	Low

6. Exacerbated stress to fish from low flows and warmer water

TEP goal affected: Reduce instream temperatures to meet salmonid requirements

Near term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat Improvement	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High
	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	All	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of big restoration projects via monitoring	All	High	High	High
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	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		All	Medium	High	Medium
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade	Biodiversity and habitat	Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Land-owners, Local governments (municipal, county)	High	High	Low
Reduce water demand	Education and outreach on water conservation			Watershed councils, municipalities, media, water districts	High	High	Medium

7. Greater demand for use of riprap and other measures to combat erosion

TEP goal affected: Reduce the adverse impacts of erosion and sedimentation from developed and developing areas

Near term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				City planning, County planning, DSL (Div. of State Lands)			

8. More resources and funds required by TEP and partners to enhance estuary habitats

TEP goal affected: Assess, protect and enhance estuary and tidal habitats

Near term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Expand organizational capacity	Extend partnerships	Building capacity, greater community engagement		Many different agencies, groups, private individuals, local businesses, and others	High	High	Low
	Write grant proposals		Competition for potential money/grant funds	Many different agencies, groups, private individual, local businesses, and others	High	High	Medium
	Expand capacity			Many different agencies, groups, private individuals, local businesses, and others	High	High	Medium

9. Negative impacts to shellfish, crabbing, and fishing industries and recreational opportunities

TEP goal affected: Promote beneficial uses of the bays and rivers

Near term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Limit nutrient inputs	Farm water quality plans	Water quality	Impact on agriculture	NRCS/OSU Extension, DEQ, Dept. of Ag (ODA), Soil and Water Cons. District	High	Medium	Low
	Storm water management	Water quality	Cost of infrastructure improvements	City/County, DEQ	High	Medium	High
	County level ordinance or rulemaking	Water quality		County, DEQ	High	Medium	High
	Domestic sewage - septic system improvements or upgrades	Water quality	Cost of infrastructure improvements	City/County, private land-owners, DEQ	High	Medium	High
	Municipal sewage - wastewater treatment plant upgrades	Water quality	Cost of infrastructure improvements	Cities and Districts, DEQ	High	Medium	High
	Water quality monitoring and assessment (for quicker response)	Water quality		DEQ, EPA, ODA	Medium	High	High

Reduce greenhouse gas emissions across the County	TBD Actions to reduce GHG emissions	Help meet state GHG targets					
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10. Lower survival of newly planted vegetation.

TEP goal affected: Assess, protect, and enhance riparian habitat.

Near term, high likelihood, high consequence.

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Improve riparian planting survival	Plant diverse species in riparian areas	Water quality		Watershed councils, Land trusts	High	High	Medium
	Replant riparian areas as needed	Water quality		Watershed councils, Land trusts	High	High	Medium
	Monitor riparian planting survival			Watershed councils, Land trusts	High	High	Medium

11. Difficulty meeting suspended sediment targets and disruption of spawning and refuge habitat quality for juvenile fishes

TEP goal affected: Reduce instream suspended sediments to meet salmonid requirements

Near term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat improvement	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High
	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Cost	All	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of restoration projects via monitoring	All	High	High	High
	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		All	Medium	High	Medium

Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade	Biodiversity and habitat	Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Landowners, Local governments (municipal, county)	High	High	Low

12. Contamination of waterways and disruption to fish passage

TEP goal affected: Reduce instream suspended sediments to meet salmonid requirements

Near term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Improvements to infrastructure	Identify culverts and roads most at risk of failure from high flows (esp. those culverts with insufficient capacity)		Access to culverts and roads on private lands	NRCS, County, Cities, ODF, USFS, BLM, Landowners, ODOT	Medium	High	Low
	Replace or remove culverts and roads most at risk	Safety and access benefits	Cost, regulatory components, waste disposal/management, land availability for relocation	Wastewater treatment plants (special districts), EPA, DEQ, Tillamook County (as permitter)	High	Medium	High
	Move/improve (lagoon to cistern) wastewater treatment lagoons (a few in Nehalem, Cloverdale) to reduce risk from overflowing	Fisheries and shellfisheries	Cost, landowner participation, re-routing traffic, regulatory components	Municipalities, special districts, Oregon health authority, DEQ	High	Medium	High

13. Changes in FEMA designations, which in turn limit land use for agriculture

TEP goal affected: Improve farm management practices

Near term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Transfer				DOA, USDA, FEMA			

14. Lower dissolved oxygen and decreased survival of aquatic species

TEP goal affected: Assess, protect, and enhance instream habitat

Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat improvement	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High
	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	All	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High

	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of big restoration projects via monitoring	All	High	High	High
	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of big restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		All	Medium	High	Medium
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade	Biodiversity and habitat	Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Land-owners, Local governments (municipal, county)	High	High	Low

15. Reduced ability of TEP's partners to assess the health of salmonids via sampling

TEP goal affected: Assess health of salmonid, shellfish, and other aquatic species stocks

Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Transfer							

16. Overdraft of river water and potential shift to groundwater use during low flow periods

TEP goal affected: Promote beneficial uses of the bays and rivers

Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Transfer							

17. Spring Chinook eggs disrupted by higher peak flows

TEP goal affected: Promote beneficial uses of the bays and rivers

Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat improvement	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High

	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	All	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of big restoration projects via monitoring	All	High	High	High
	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of big restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		All	Medium	High	Medium
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade	Biodiversity and habitat	Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Land-owners, Local governments (municipal, county)	High	High	Low

18. Higher water demand for grass in summer, while supplies are already limited

TEP goal affected: Improve farm management practices

Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Transfer				Oregon Water Resources, ODFW, water rights inventory			

19. Native fish less competitive against warm water fish such as bass, pan fish, and others

TEP goal affected: Reduce instream temperatures to meet salmonid requirements

Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat improvement	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High

	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	All	High	High	High
	66.2.c. Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of big restoration projects via monitoring	All	High	High	High
	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of big restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private landowners USFW, ODFW, NOAA, ODA, OWRD	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private landowners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
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Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade	Biodiversity and habitat	Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Landowners, Local governments (municipal, county)	High	High	Low

20. More gravel deposits and downed wood, especially in areas with steep slopes, could have positive impacts to fish habitat in headwater streams, but risk in lowlands near infrastructure

TEP goal affected: Improve channel features to improve sediment storage and routing

Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Identify and prioritize areas for restoration	Identify sites where gravel deposits and downed wood might enhance fish habitat		Land ownership	Landowners, USFS, BLM	Medium	Medium	Medium
Habitat improvement	Promote natural LWD jams and gravel retention in headwater streams	Water temperature	Land ownership	Landowners, USFS, BLM	High	High	High
Identify and prioritize areas for restoration	Identify sites where gravel deposits and downed wood might enhance fish habitat		Land ownership	Landowners, USFS, BLM	Medium	Medium	Medium

21. Higher erosion on agricultural lands, requiring more cover crops

TEP goal affected: Reduce the adverse impacts of erosion and sedimentation from developed and developing areas
Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				Individual farmers, ODA (they are required to plant cover crops)			

22. Changes in species distribution and habitat use in estuaries (from streamflow changes)

TEP goal affected: Assess, protect and enhance estuary and tidal habitats
Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Accept							

23. Estuary protection and restoration are more difficult to implement in some areas due to development of barriers

TEP goal affected: Assess, protect and enhance estuary and tidal habitats
Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Reduce impacts of new and existing development on estuaries	Make recommendations to County and Planning Department for policies, related to new development, that support estuary conservation and habitat migration	Lower risk to new infrastructure; potentially lower insurance costs	Potential conflict between conservation and development	County/City	Medium	Medium	Low
	Replace/remove/remediate existing infrastructure and development vital to estuary conservation and ecological functioning over long time frames	Water quality; lower risk to infrastructure	Loss of property. Potential conflict between conservation and development	State, Feds, NGOs	Medium	Medium	High

24. Changes in ocean-based prey, affecting salmonids, birds, and other species

TEP goal affected: Promote beneficial uses of the bays and rivers
Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Limit nutrient inputs	Farm water quality plans	Water quality	Impact on agriculture	NRCS/OSU Extension, DEQ, ODA, Soil and Water Cons. District	High	Medium	Low
	Storm water management	Water quality	Cost of infrastructure improvements	City/County, DEQ	High	Medium	High
	County level ordinance or rulemaking	Water quality		County, DEQ	High	Medium	High
	Domestic sewage - septic system improvements or upgrades	Water quality	Cost of infrastructure improvements	City/County, private landowners, DEQ	High	Medium	High

	Municipal sewage - waste-water treatment plant upgrades	Water quality	Cost of infrastructure improvements	Cities and Districts, DEQ	High	Medium	High
	Water quality monitoring and assessment (for quicker response)			DEQ, EPA, ODA	Medium	High	High
Reduce greenhouse gas emissions across the County	TBD Actions to reduce GHG emissions	Help meet state GHG targets					

25. Reduced ability of TEP and other partners to successfully implement restoration efforts

TEP goal affected: Assess, protect, and enhance riparian habitat

Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Improve riparian planting survival	Plant diverse species in riparian areas	Water quality		Watershed councils, Land trusts	High	High	Medium
	Replant riparian areas as needed	Water quality		Watershed councils, Land trusts	High	High	Medium
	Monitor riparian planting survival			Watershed councils, Land trusts	High	High	Medium

26. Declines in aquatic organisms sensitive to higher temperatures

TEP goal affected: Assess, protect, and enhance wetland habitat

Near term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Identify and prioritize areas for restoration	Identify areas and prioritize by estuarine and freshwater type. Freshwater wetlands expected to be more vulnerable under drought scenarios.			All	High	High	Medium
Restore wetlands and floodplains	Planting and restoration of wetlands with species that are better adapted to climate variability	Flood abatement and water quality		All	High	High	High
	Restore floodplain connectivity for freshwater and tidally influenced wetlands and examine underlying influences on hydrology	Flood abatement and water quality	Potentially creates conflicts between conservation and development	All	High	High	High
	Riparian restoration in stream related wetlands	Flood abatement and water quality	Potential loss or conversion of ag lands	All	High	High	High

27. Agricultural producers would need to increase restoration activities, reduce water withdrawals, and take more action to meet stream temperature requirements

TEP goal affected: Improve farm management practices

Mid term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Transfer				Oregon Dept. of Agriculture			

28. More runoff and sedimentation of streams, as well as landslides

TEP goal affected: Reduce sediment risks from forest management roads

Mid term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Improvements to infrastructure	Reduce miles of unmaintained forest roads by fully decommissioning (remove culverts, pull back unstable slopes, reduce landslide risk)	Reduce future maintenance costs	Access to private lands	ODF, Private landowners, USFS	High	Medium	High
Reduce wildfire severity	Assess fuels across landscape (wetter coast to drier inland), as well as the potential efficacy of managing fuels			ODF, USFS, BLM, landowners, Universities	Medium	Medium	Low
	Based on the results of the assessment, manage fuels for reduced wildfire severity while maintaining ecological values and function.	Safety and emergency preparedness	Access to private lands, Needs ongoing and continuous effort to be effective, fuels management not necessarily effective	ODF, Private landowners, USFS	Medium	Medium	High

29. Changes in the distribution and extent of tidal habitats, including low salt marsh, high marsh, and mudflats

TEP goal affected: Assess, protect and enhance estuary and tidal habitats

Mid term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Assess and manage for projected change	Re-map estuarine sediments and habitats			Federal, state, local agencies, NGOs, general public	High	High	High
	Revise management units to protect estuarine fringe		Political challenges to revising management units	Federal, state, local agencies, NGOs, general public	High	Medium	High
	Accept loss of current boundaries			Federal, state, local agencies, NGOs, general public	Low	Low	Low

30. Changes in bird species and other wildlife, with some species losing habitat while others gain habitat

TEP goal affected: Assess, protect, and enhance wetland habitat

Mid term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Assess and manage for projected change	Identify at risk habitats, birds, and species			ODFW, USFWS, NOAA, Audubon	High	Medium	Medium
Restore wetlands and floodplains	Planting and restoration of wetlands with species that are better adapted to climate variability	Flood abatement and water quality	Potential conflicts between development and conservation	ODFW, USFWS, NOAA, Audubon	High	High	High
	Restore floodplain connectivity for freshwater and tidally influenced wetlands and examine underlying influences on hydrology	Flood abatement and water quality	Potentially creates conflicts between conservation and development	County, state, federal, city, private land managers and owners, NGOs	High	High	High

31. Increased flood damage and declining water quality

TEP goal affected: Assess, protect, and enhance wetland habitat

Mid term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Identify and prioritize areas for restoration	Identify areas and prioritize by estuarine and freshwater type. Freshwater wetlands expected to be more vulnerable under drought scenarios.		Potentially creates conflicts between conservation and development	County, state, federal, city land managers and owners, NGOs	High	High	Medium
Restore wetlands and floodplains	Planting and restoration of wetlands with species that are better adapted to climate variability	Biodiversity and habitat	Species may not be native to the region	County, state, federal, city, private land managers and owners, NGOs	High	High	High
	Restore floodplain connectivity for freshwater and tidally influenced wetlands and examine underlying influences on hydrology	Biodiversity and habitat	Potentially creates conflicts between conservation and development	County, state, federal, city, private land managers and owners, NGOs	High	High	High

32. Reduced water quality and instream habitat quality from sedimentation

TEP goal affected: Assess, protect, and enhance instream habitat

Mid term, high likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Improve understanding of risks related to wildfire, forest management and climate change	Review salvage logging practices for better understanding of how this risk affects the region			ODF, Private landowners, USFS	Medium	High	Low
	Assess fuels across landscape (wetter coast to drier inland) and manage appropriately			ODF, Private landowners, USFS	Medium	High	Low
Improvements to infrastructure	Reduce miles of unmaintained forest roads by fully decommissioning (remove culverts, pull back unstable slopes, reduce landslide risk)		Access to private lands	ODF, Private landowners, USFS, NGOs	Medium	High	High

33. Regulatory consequences of not meeting salmonid temperature requirements

TEP goal affected: Reduce instream temperatures to meet salmonid requirements

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer							

34. Water quality declines and difficulty meeting targets

TEP goal affected: Reduce instream suspended sediments to meet salmonid requirements

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				Private timber industry, ODF, USFS, EPA, DEQ			

35. Higher risk of erosion and landslides

TEP goal affected: Reduce sediment risks from forest management roads

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				Private timber industry, ODF, USFS			

36. More culvert replacement and repair necessary, as well as more road maintenance, affecting many areas with unmaintained or legacy roads

TEP goal affected: Reduce sediment risks from forest management roads

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Assess and manage for projected change	Assess precipitation standards for culverts and roads (e.g. 100-year storms) based on climate projections and review current standards			Landowners, state or federal agencies, Universities	Medium	Medium	Medium
	Education and outreach to promote appropriate standards to all groups (landowners, agencies, Counties, etc.)	Access during wildfire; Fish passage improvements; Water quality improvements	Short-term disturbance associated with repair and upgrades	Land managers, Watershed councils	High	Medium	Low

37. More sedimentation from wildfires at upper elevations

TEP goal affected: Reduce the adverse impacts of rapidly moving landslides

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer	Monitor/Revisit because thinning as a restoration technique could be called for to mitigate wildfire						

38. Bacteria from waste (esp. manure) flushed into the bays, affecting shellfish closures

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Improvements to infrastructure	Improvements to septic systems	Water quality, health, tourism	Cost, landowners	Landowners, County, Municipalities, DEQ	High	Medium	High
	Improvements to stormwater (stormwater retention)	Water quality, health, tourism	Cost	Landowners, County, Municipalities, DOT, DEQ, ODA	High	Medium	High
Manage streamflow	Sustainable water storage and release	Water quality, health, tourism	Water rights, costs, permits	OWRD, DEQ, ALL	Medium	Medium	High
Agricultural management	Manure management	Water quality, health, tourism		DEQ, ODA	High	Medium	Medium

	Education and outreach on manure management	Water quality, health, tourism		DEQ, ODA	Medium	Medium	Medium
Limit nutrient inputs	Bacterial DNA identification to identify source	Water quality, health, tourism	Cost	DEQ, ODA	Medium	Medium	Medium
	Point source identification	Water quality, health, tourism		DEQ, ODA	Medium	Medium	High

39. Reduced effectiveness of restoration activities in providing important habitat for fish and wildlife

TEP goal affected: Assess, protect, and enhance riparian habitat

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Improve understanding of risks related to wildfire, forest management and climate change	Review riparian practices for areas affected by wildfire						
Reduce wildfire severity	Assess fuels across landscape (wetter coast to drier inland), as well as the potential efficacy of managing fuels			ODF, USFS, BLM, landowners, Universities	Medium	Medium	Low
	Based on the results of the assessment manage fuels for reduced wildfire severity while maintaining ecological values and function.	Safety and emergency preparedness	Access to private lands, Needs ongoing and continuous effort to be effective	ODF, Private landowners, USFS	Medium	Medium	High

40. Exacerbate current issues and push systems beyond ecological and functional thresholds

TEP goal affected: Improve floodplain condition

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Habitat improvement	Large scale, holistic floodplain management to maintain and enhance complexity and function	Biodiversity and habitat, flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High

41. Damage to wetlands in forested areas, such as spruce swamp

TEP goal affected: Assess, protect, and enhance wetland habitat

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Transfer				ODF, USFS, Private timber industry			

42. Loss of wetland endemic species and specialists

TEP goal affected: Assess, protect, and enhance wetland habitat

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Identify and prioritize areas for restoration	Identify areas and prioritize by estuarine and freshwater type. Freshwater wetlands expected to be more vulnerable under drought scenarios.			All	High	High	Medium
Restore wetlands and floodplains	Planting and restoration of wetlands with species that are better adapted to climate variability	Flood abatement and water quality		All	High	High	High
	Restore floodplain connectivity for freshwater and tidally influenced wetlands and examine underlying influences on hydrology	Flood abatement and water quality	Potentially creates conflicts between conservation and development	All	High	High	High
	Riparian restoration in stream related wetlands	Flood abatement and water quality	Potential loss or conversion of ag lands	All	High	High	High
Protect groundwater sources	TBD		Water rights and use	OWRD	High	Medium	High

43. Build up of manure due to drought

TEP goal affected: Improve farm management practices

Mid term, medium likelihood, high consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				ODA, Health department, DEQ, others			

44. Inundated areas and habitats affected by infrastructure failure during king tides

TEP goal affected: Assess, protect and enhance estuary and tidal habitats

Mid term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Assess and manage for projected change	Using sea level rise study/report, assess culverts, dikes, other infrastructure, and natural areas at risk			Tillamook County/Cities	High	High	Low
	Prioritize, replace, remove, and remediate based on the results of the above study.		Could create conflict between conservation vs. development	ODOT, ODFW, Feds, NGOs	High	Medium	High

45. Impacts to desirability of the region for tourist travel from water shortages

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				EPA, DEQ			

46. Increases in algae, bacteria, and other water-borne diseases, which can cause human illness

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Improvements to infrastructure	Improvements to septic systems	Fisheries and shellfisheries	Cost, landowners	Landowners, County, Municipalities, DEQ	High	Medium	High
	Improvements to stormwater (stormwater retention)	Fisheries and shellfisheries	Cost	Landowners, County, Municipalities, DOT, DEQ, ODA	High	Medium	High
Manage streamflow	Sustainable water storage and release	Fisheries and shellfisheries	Water rights, costs, permits	OWRD, DEQ, ALL	Medium	Medium	High
Agricultural management	Manure management	Fisheries and shellfisheries		DEQ, ODA	High	Medium	Medium
	Education and outreach on manure management	Fisheries and shellfisheries		DEQ, ODA	Medium	Medium	Medium
Limit nutrient inputs	Bacterial DNA identification to identify source	Fisheries and shellfisheries	Cost	DEQ, ODA	Medium	Medium	Medium
	Point source identification	Fisheries and shellfisheries		DEQ, ODA	Medium	Medium	High
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium

47. Increases in algae, bacteria, and other water-borne diseases, which can cause human illness

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Improvements to infrastructure	Improvements to septic systems	Fisheries and shellfisheries	Cost, landowners	Landowners, County, Municipalities, DEQ	High	Medium	High
	Improvements to stormwater (stormwater retention)	Fisheries and shellfisheries	Cost	Landowners, County, Municipalities, DOT, DEQ, ODA	High	Medium	High
Manage streamflow	Sustainable water storage and release	Fisheries and shellfisheries	Water rights, costs, permits	OWRD, DEQ, ALL	Medium	Medium	High
Agricultural management	Manure management	Fisheries and shellfisheries		DEQ, ODA	High	Medium	Medium
	Education and outreach on manure management	Fisheries and shellfisheries		DEQ, ODA	Medium	Medium	Medium
Limit nutrient inputs	Bacterial DNA identification to identify source	Fisheries and shellfisheries	Cost	DEQ, ODA	Medium	Medium	Medium
	Point source identification	Fisheries and shellfisheries		DEQ, ODA	Medium	Medium	High
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation, warming water in ponds, misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium

48. Large scale die offs of certain tree species that are unfit for the new climatic conditions

TEP goal affected: Promote beneficial uses of the bays and rivers

Long term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Increase forest diversity and resilience	Replant with multiple tree species to preserve and enhance diversity	Biodiversity and habitat	Native versus non-native species issues	Private land-owners, federal and state agencies, Universities	Medium	Low	Medium
	Assess establishment and survival of tree species post-disturbance and over longer time periods to determine the most suitable species for planting	Biodiversity and habitat	Long term monitoring needed	Private land-owners, federal and state agencies, Universities	High	Medium	Medium

49. Negative impacts to the forestry industry from large and catastrophic fires

TEP goal affected: Promote beneficial uses of the bays and rivers

Long term, high likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				Private timber industry, ODF, USFS			

50. Overall loss of available fish habitat reduces angling opportunities

TEP goal affected: Promote beneficial uses of the bays and rivers

Near term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				ODFW, NOAA, USFWS			

51. Forest managers required to protect more area from logging that removes roots, disturbs slopes, and increases risk

TEP goal affected: Reduce the adverse impacts of rapidly moving landslides

Near term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				ODF, Private timber industry, USFS			

52. Increased toxics from flooded contaminated sites and redistribution of toxic hotspots

TEP goal affected: Assess, protect and enhance estuary and tidal habitats

Near term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				DEQ, EPA			

53. Reduced survival of riparian plantings near steep slopes

TEP goal affected: Assess, protect, and enhance riparian habitat

Near term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Improve riparian planting survival	Plant diverse species in riparian areas	Water quality		Watershed councils, Land trusts	High	High	Medium
	Replant riparian areas as needed	Water quality		Watershed councils, Land trusts	High	High	Medium
	Monitor riparian planting survival			Watershed councils, Land trusts	High	High	Medium

54. Less shading and warmer water, reduced instream habitat quality

TEP goal affected: Assess, protect, and enhance instream habitat

Mid term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Continue with current management strategies and monitor for changes	Maintain Riparian Management Areas (RMAs) strategies			USFW, ODFW, NOAA	High	High	Medium
	Monitor for changes in vegetation			USFW, ODFW, NOAA	High	High	Medium
Develop appropriate vegetation management actions if changes are detected	Change in the type of vegetation used in riparian restoration activities			All landowners, OSU Research, USFW, ODFW, NOAA	High	High	Low

55. Reduced water quality from sedimentation, nutrients, and bacterial contamination related to livestock

TEP goal affected: Assess, protect, and enhance instream habitat

Mid term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Agricultural management	Off channel watering	Riparian habitat improvements	Private landowners, ODA regulations and Farm Management Plans	Landowners, ODA, Soil and Water Cons Dist, NRCS	High	Medium	High
	Rainwater collection off barn/storage roofs for watering	Riparian habitat improvements	Private landowners, ODA regulations and Farm Management Plans	Landowners, ODA, Soil and Water Cons Dist, NRCS	High	Low	Medium
	Animal exclusion fencing	Riparian habitat improvements	Infringement on use of ag lands	Landowners, ODA, Soil and Water Cons Dist, NRCS	High	High	Medium
	Promote (construct) livestock crossings at bridge/hardened fords		Water quality related to nutrients and bacteria not addressed, Permits	Landowners, ODA, Soil and Water Cons Dist, NRCS	Medium	Medium	High

56. Impacts to native aquatic wildlife (especially fish) and vegetation

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat Improvement	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High
	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	All	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of big restoration projects via monitoring	All	High	High	High
	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of big restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private land-owners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		All	Medium	High	Medium
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade	Biodiversity and habitat	Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Land-owners, Local governments (municipal, county)	High	High	Low
Reduce water demand	Education and outreach on water conservation			Watershed councils, municipalities, media, water districts	High	High	Medium

57. Water treatment facilities shut down from too much sedimentation in rivers and creeks

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Improvements to infrastructure	Identify culverts and roads most at risk of failure from high flows (esp. those culverts with insufficient capacity)		Access to culverts and roads on private lands	NRCS, County, Cities, ODF, USFS, BLM, Landowners, ODOT	Medium	High	Low
	Replace or remove culverts and roads most at risk	Safety and access benefits	Cost, regulatory components, waste disposal and management, land availability for relocation	Wastewater treatment plants (special districts), EPA, DEQ, Tillamook County (as permitter)	High	Medium	High
	Reduce miles of unmaintained forest roads by fully decommissioning (remove culverts, pull back unstable slopes, reduce landslide risk)	Reduce future maintenance costs	Access to private lands	ODF, Private landowners, USFS	High	Medium	High
Reduce wild-fire severity	Assess fuels across landscape (wetter coast to drier inland), as well as the potential efficacy of managing fuels			ODF, USFS, BLM, landowners, Universities	Medium	Medium	Low
	Based on the results of the assessment, manage fuels for reduced wildfire severity while maintaining ecological values and function	Safety and emergency prepared-ness	Access to private lands, Needs ongoing and continuous effort to be effective	ODF, Private landowners, USFS	Medium	Medium	High
Improve land management practices in high risk areas	Change policy on ground cover retention on steep slopes to increase cover and re-plant	Water quality		Private land owners, USFS, BLM, ODF	Medium	Medium	Low

58. More stormwater control measures required due to non point-source pollution entering streams

TEP goal affected: Assess and upgrade urban non-point treatment infrastructure

Mid term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer							

59. Reduced beach and shore access for recreational opportunities and habitat restoration due to new armoring and other treatments to prevent erosion

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				Tillamook County, Cities			

60. Simplification of riparian areas, loss of side channels for flood abatement and significant impacts to fish

TEP goal affected: Improve floodplain condition

Mid term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Habitat improvement	Set back dikes to increase channel width and improve floodplain function	Biodiversity and habitat, flood abatement	Landowners' expectations, remove land from management and taxation	Landowners and granting agencies			
	Large scale, holistic floodplain management to maintain and enhance complexity and function						

61. Agricultural producers may need to plant alternatives

TEP goal affected: Improve farm management practices

Mid term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				Agricultural Extension			

62. Shorter agricultural growing season due to waterlogged grasses

TEP goal affected: Improve farm management practices

Mid term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				DOA, Private landowners, Agricultural Extension			

63. Higher densities and less oxygen lead to shifts in energy budgets for fish

TEP goal affected: Assess health of salmonid, shellfish, and other aquatic species stocks

Mid term, high likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	All	Medium	Medium	High
Habitat improvement (to maintain or reduce temps)	Increase off-channel habitat	Flood abatement	Space availability, costs, permits	All	High	High	High
	Large woody debris (LWD) to collect gravels for more subsurface flow and assist catching landslide material	Reduce water temperatures	Costs	All	High	High	High
	Floodplain habitat restoration	Flood abatement	Perceived conflicts between conservation and development/other land uses, permits	All	High	High	High
	Riparian plantings	Biodiversity and habitat		Watershed councils, Land trusts	High	High	High
	Stream channel restoration to create more channel complexity	Flood abatement	Difficult to show success of big restoration projects via monitoring	All	High	High	High

	Reconnect springs, wetlands, floodplains that can serve as cold water refugia	Flood abatement	Difficult to show success of big restoration projects via monitoring	Watershed councils	High	High	High
	Address warming caused by inline impoundments	Water quality	Balance water need with flow requirements for cooling	Private landowners USFW, ODFW, NOAA, ODA, OWRD	Low	Low	High
	Forest management strategy to balance water absorption	Biodiversity and habitat	Forest practices	Private landowners USFW, ODFW, NOAA, ODA, OWRD	Medium	Medium	High
	Increase diversity of habitat to create more salmonid life history options	Biodiversity and habitat		All	Medium	High	Medium
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium
Protect existing habitat	Protect existing healthy riparian vegetation, which provides shade		Property/landowner concerns and rights, limitations on use and perceived use	USFWS, ODFW, NOAA, Landowners, Local governments (municipal, county)	High	High	Low
Assess and manage for projected change	Develop/use models to view stream estuary conditions 50-100 years out (for planning current and near future actions)	Inform many other plans and projects	Property/landowner concerns and rights, limitations on use and perceived use Model development	Universities or govt. agencies	Medium	Medium	Medium

64. More angling closures in recreational fisheries

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, high likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Transfer				ODFWS, USFWS			

65. More marine/brackish conditions favoring marine organisms in estuaries

TEP goal affected: Assess health of salmonid, shellfish, and other aquatic species stocks

Mid term, high likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Accept	Monitor and revisit						

66. Greater need for restoration activities for bays and rivers due to use

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, high likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Reduce visitor impacts to bays and rivers	Education and outreach	Can combine with other outreach efforts; brings visibility to TEP		Watershed councils, municipalities, media	High	High	Medium

67. Economic stress to farmers from increasing inundation of agricultural lands with sea water

TEP goal affected: Improve farm management practices

Mid term, high likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Agricultural management	Improve drainage function of lower tidal wetlands through restoration, thereby improving productivity of upland agricultural areas	Biodiversity and habitat	Permitting, landowner participation, cost, offsite impacts (or perceptions of)	ODA, Tillamook County, FEMA, ODFW, NRCS, NOAA, USFWS, Landowners, Local govts.	High	High	High

68. Increased build up of manure from increased winter precipitation

TEP goal affected: Improve farm management practices

Mid term, high likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Transfer				ODA, private farmers, EPA, DEQ			

69. Declines in water quality and beneficial uses of bays and rivers

TEP goal affected: Promote beneficial uses of the bays and rivers

Long term, medium likelihood, medium consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Continue water quality monitoring	Continue water quality monitoring				Medium	High	Medium
Reduce visitor impacts to bays and rivers	Education and outreach to share water quality info with stakeholders and users			Watershed Councils	Medium	High	Low
	Education and outreach to keep users away from stressed areas	Biodiversity and habitat	Difficult to affect people's behavior; no enforcement	Many education partners, Community volunteers	High	Medium	Medium

70. Loss of important riparian habitats for species such as birds, small mammals, insects, and amphibians

TEP goal affected: Assess, protect, and enhance riparian habitat

Mid term, medium likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effective-ness	TEP influence	Relative cost
Continue with current management strategies and monitor for changes	Maintain Riparian Management Areas (RMAs) strategies			USFW, ODFW, NOAA, Farm Bureau, ODA, TNC, ODF	High	High	Medium
	Monitor for changes in vegetation			USFW, ODFW, NOAA, Farm Bureau, ODA, TNC, ODF	High	High	Medium
Develop appropriate vegetation management actions if changes are detected	Change in the type of vegetation used in riparian restoration activities			All landowners, OSU Research, USFW, ODFW, NOAA	High	High	Low

Habitat improvement	Expand conservation and restoration activities to ensure maintenance of specific types of wildlife habitat	Ecosystem services		Watershed councils, TNC, USFWS	High	High	High
Increase strategy for invasive management	Aggressive PRISM approach				High	High	Medium
	Herbicide use for control		Increased herbicide use		Medium	High	Medium

71. Impacts to desirability of the region for tourist travel from beach closures

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, low likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Improvements to infrastructure	Move/improve (lagoon to cistern) wastewater treatment lagoons (a few in Nehalem, Cloverdale) to reduce risk from overflowing	Fisheries and shellfisheries	Cost, landowner participation, re-routing traffic, regulatory components	Municipalities, special districts, Oregon health authority, DEQ	High	Medium	High
	Improvements to septic systems	Fisheries and shellfisheries	Cost, landowners	Landowners, County, Municipalities, DEQ	High	Medium	High
	Improvements to stormwater infrastructure	Fisheries and shellfisheries	Cost	Landowners, County, Municipalities, DOT, DEQ, ODA	High	Medium	High
Manage streamflow	Sustainable water storage and release	Water quality	Water rights, costs, permits	OWRD, DEQ, ALL	Medium	Medium	High
Increase natural upland water storage	Promote beaver habitat in the uplands	Biodiversity and habitat	Loss of riparian vegetation and warming water in ponds, potential misperception, landowner concerns	USFWS, ODFW	Unknown	Medium	Medium

72. More frequent limits on commercial and recreational use of bays from storms

TEP goal affected: Promote beneficial uses of the bays and rivers

Mid term, low likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Accept							

73. Increased occurrence of human-wildlife conflicts and crop damage

TEP goal affected: Improve farm management practices

Mid term, low likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Transfer				USDA Wildlife Services, Planning Commissions			

74. Saltwater intrusion impacts to residential and agricultural groundwater users

TEP goal affected: Promote beneficial uses of the bays and rivers

Long term, low likelihood, low consequence

Potential strategies	Potential Actions	Co-benefits	Barriers or conflicts	Partners	Effectiveness	TEP influence	Relative cost
Transfer				EPA, DEQ			