NATURAL CAPITAL ASSET AND RISK REGISTER TO INFORM THE TAMAR ESTUARIES MANAGEMENT PLAN AND IMPLEMENTATION OF PLYMOUTH NATIONAL MARINE PARK

PART THREE: IMPLICATIONS OF TAMAR ESTUARY MANAGEMENT PLAN ACTIONS ON THE STATE OF NATURAL CAPITAL ASSETS AND FLOW OF ECOSYSTEM SERVICES

Suggested citation for this report:

Ashley, M., Rees, S., Mullier, T., 2021 Natural Capital Asset and Risk Register to Inform Marine Site Management Plans and Implementation of Plymouth National Marine Park. Part Three: Implications of Tamar Estuary Management Plan Actions on the State of Natural Capital Assets and Flow of Ecosystem Services.

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Acknowledgements:

This report was funded by NERC- SWEEP NE/P011217/1.The authors would like to thank staff from the Devon and Severn IFCA, Cornwall IFCA, Plymouth Marine Laboratory, The Marine Management Organisation, Environment Agency, Natural England, Plymouth City Council for assistance with data and advice and all who contributed their time and knowledge.

CONTENTS

INTRODUCTION, BACKGROUND AND SCOPE

The baseline Natural Capital Asset and Risk Register for the Plymouth Sound Estuaries and Coast (PSEC) area, undertaken in Part Two of this report (Ashley et al., 2021), provides the evidence underpinning the assessment of impact of management plan actions on state of habitat and species assets and resulting flow of ecosystem services (Ashley et al., 2021, Rees et al., 2019).

The existing Tamar Estuaries Management Plan (TEMP) provides the existing management plan for the Plymouth Sound and Estuaries MPAs (TECF, 2012) (Figure 1). Within this Part Three study, the asset and risk register tool is applied as a tool to review implications of both completed and ongoing TEMP management actions on state of asset extent and condition and resulting risk to contribution to ecosystem service benefits (Ashley et al., 2021, Rees et al., 2019, Mace et al., 2015). We also identify future TEMP action priorities to enable flow of ES benefits to be maximised in the site and how supporting flow of ES benefits enables goals of a National Marine Park.

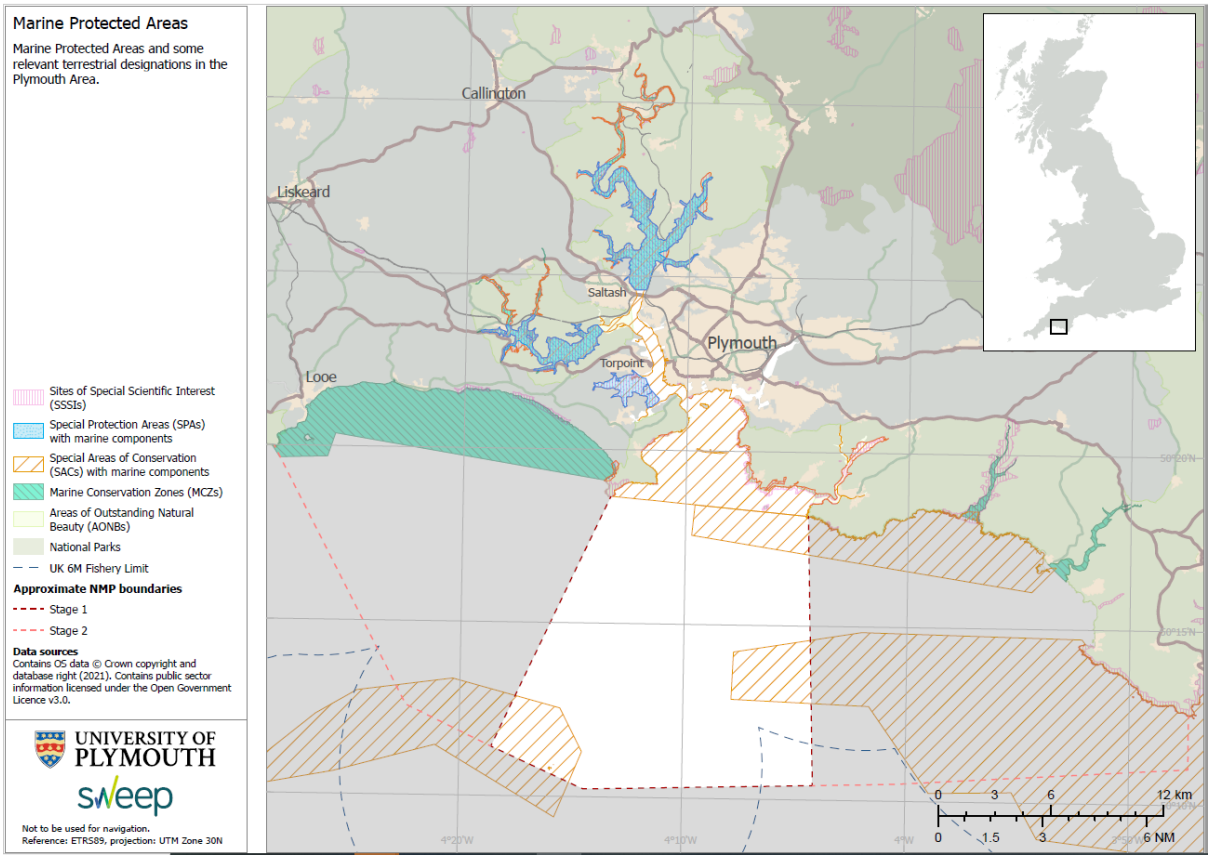


Figure 1 The site incorporated in the TEMP, including the Plymouth Sound and Estuaries SAC, from the tidal limits of estuaries to the mouth of Plymouth Sound, incorporating Tamar Estuaries Complex SPA (And Tamar Estuary Sites MCZ and marine and intertidal components of Sites of Special Scientific Interest (SSSIs). The asset and risk register assessment also includes the coastal region outside the SAC within the first stage of the proposed Plymouth National Marine Park (white area). Neighbouring MPA designations are shown for context.

MPAs considered in this study, as they interact with the TEMP management area, include European Marine Sites (EMS) designated under European Law (EC Habitats Directive 1992), such as Plymouth Sound and Tamar Estuaries Special Area of Conservation (SAC). SACs represent one form of a suite of MPAs in UK waters that protect some of our most important marine and coastal habitats and species of European and national importance. Other EMS sites designated under the Habitats Directive include Special Protection Areas (SPAs)

covered by tidal waters, including Tamar Estuaries Complex SPA. Further MPA sites include those designated under UK law: Marine Conservation Zones (MCZs), (Marine and Coastal Access Act 2010) such as Tamar Estuary Sites MCZ and marine and intertidal components of Sites of Special Scientific Interest (SSSIs) within the PSEC area (The Wildlife & Countryside Act 1981).

The area assessed in the Tamar Estuaries Management Plan is also encompassed by the proposed Plymouth National Marine Park (PNMP) (stage 1). Thereby, the site provides a diverse mix of European and nationally important habitats and species and cultural and heritage assets. Understanding the health of these habitats and species features, the benefits people both locally and internationally obtain from them, and addressing management requirements to reduce pressures on the health of the natural resources within the site, is an essential first step to underpin the sustainable provision of benefits that support environment and community health and wellbeing (Rees et al., 2019, Pittman et al., 2019, Plymouth City Council, 2019, Curry et al., 2017).

The application of the asset and risk register tool is intended to aid assessment of impact of existing management actions and identification of management priorities for the future, to ensure flow of ES benefits from natural capital assets are secured into the future. This work builds on development of the natural capital and asset register tool in the North Devon Marine Pioneer (Rees et al., 2019) and the application of the asset and risk register tool to inform marine management decisions in Isles of Scilly Inshore Fisheries and Conservation Authority District (Ashley et al., 2020) and to inform sustainability appraisal in North Devon (Hooper and Austen, 2020)

The management actions and non-statutory partnership actions in the TEMP are restricted to the Plymouth Sound and Estuaries SAC and Tamar Estuaries Complex SPA (TEMP, 2012). However, the first stage of the Plymouth National Marine Park includes the Eddystone region of Start Point to Plymouth Sound and Eddystone SAC and areas outside MPAs. Therefore, wider regional pressures and management needs are also considered. Likewise, the impact of TEMP management actions on condition of habitat and species assets in the wider coastal region and risk to ES provision regionally, and even internationally, are also considered.

TAMAR ESTUARIES MANAGEMENT PAN (TEMP)

The 2012-2018 TEMP is the fourth delivery of a management plan for the Plymouth Sound and Estuaries, developed by Tamar Estuaries Consultative Forum (TECF) (TECF, 2012). TECF provides partnership management of the Plymouth Sound and Estuaries SAC and Tamar Estuaries Complex SPA European Marine Sites (EMS).

Such partnership is required due to the complexities of the site, containing large urban centres, western Europe's largest naval port, as well as international commercial and passenger ports. TECF is chaired by the Queen's Harbour Master (QHM) for the Dockyard Port of Plymouth, and hosted by Plymouth City Council. The Forum is made up of Relevant Authorities – government departments and public or statutory bodies with local powers or functions that have, or could have, an impact over the marine environment of the Marine Protected Areas (MPAs) (TECF, 2014).

The TEMP serves a dual purpose. It addresses delivery of statutory duties by addressing risks in relation to the Plymouth Sound and Estuaries SAC and Tamar Estuaries Complex SPA European Marine Sites (EMS), as well as initiating a wider range of partnership projects that aim to deliver wider social and economic gains (TECF, 2012) (Figure 2).

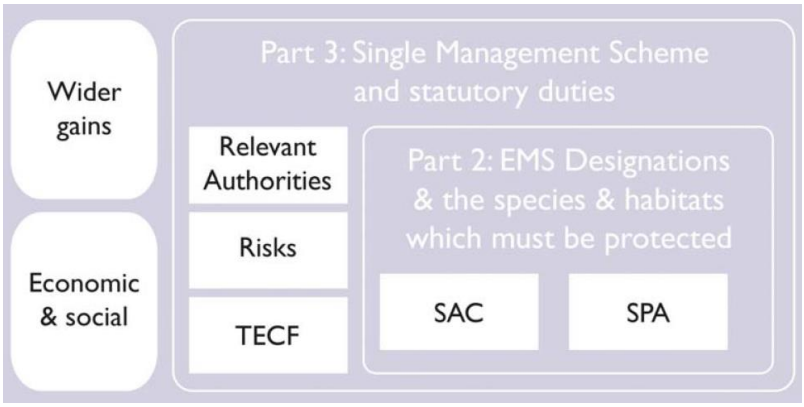


Figure 2 Structure of the Tamar Estuaries Management Plan 2012-2018 (TECF, 2018)

Although developed for the period 2013-2018, and certain management actions have been completed at the time of writing (2021), other actions are ongoing and impact on status of assets would not be evidenced within the baseline asset and risk register in Part One of this report.

Assessing implications of ongoing TEMP actions within the Natural Capital Asset and Risk Register tool at this stage, not only provides the opportunity to review impacts of actions taken under the 2012-2018 TEMP, but also provides guidance on priorities for management and non-statutory partnership actions to address within the future TEMP process.

The Natural Capital Approach provides a foundational framework of the United Kingdom's 25 Year Plan to Improve the Environment (HM Government, 2018). As such, consideration of impact of management actions on extent (quantity) and condition (quality) of habitat and species assets and the resulting relationship to provision of ES benefits provided to society, is central to informing future monitoring and management actions undertaken by resource managers.

The application of the Natural Capital Asset and Risk Register tool to review impact of past TEMP monitoring and management actions, implications of ongoing actions and identify priorities for future actions, is undertaken to continue to test, and enable future refinement of the approach developed within the NERC SWEEP programme and DEFRA Marine Pioneer (Ashley et al., 2019; Rees et al., 2019; Hooper et al., 2019; Ashley et al., 2020; Hooper and Austen, 2020).

NATIONAL MARINE PARK

National Marine Parks are in a conceptual phase, with the emphasis on celebrating the significance and diversity of marine and coastal areas, including the wildlife and natural resources, the people, the heritage legacy and commercial futures (Plymouth City Council, 2018; 2019; Pittman et al., 2019). As a pioneer site for the UKs first National Marine Park, University of Plymouth Marine and Coastal Policy Research Centre, Plymouth City Council and Blue Marine Foundation identified that under the National Marine Park concept:

"*A Marine Park is a specially recognised coastal or marine space important for its environment and community health and wellbeing. Marine Park status will encourage greater prosperity, responsible enjoyment, deeper knowledge and enhanced appreciation of the natural world and our place within it*." (Plymouth City Council, 2018; 2019).

Within this project, synergies between impacts of the actions undertaken within the TEMP actions and partnership projects and benefits that can enhance environment and community health and wellbeing, under the aims of the proposed Plymouth National Marine Park, are also considered and summarised (Plymouth City Council, 2019, Pittman et al., 2019). Pittman et al., (2019) identify the role of a city park enables potential to

address multiple interlinked sustainable development goals (SDGs). The focus of a city marine park relates directly to 'achieving good health and wellbeing' (sustainable development goal (SDG) 3) (United Nations, 2015, UNDP, 2021). SDG 3, in the context of the marine environment requires the environment to be in a state to support economic and recreational activities. SDG 3 is thereby interlinked with SDG 14 (conserve and sustainably use the oceans, seas, and marine resources) (Depledge et al., 2019, Claudet et al., 2020, UNDP, 2021).

RELEVANT NATURAL CAPITAL APPROACHES AND RESOURCE MANAGEMENT POLICY

NATURAL CAPITAL APPROACH

The Natural Capital Asset and Risk Register to assess impact of TEMP management actions utilises the results from application of the natural capital approach in the baseline assessment in Part Two (Ashley et al., 2021). Forecast scenarios from implications of ongoing TEMP actions on the state of habitat and species assets, that are still being undertaken at the time of writing, are also assessed within the same asset and risk register structure.

Essentially the approach identifies that, marine ecosystems provide a number of essential functions, such as primary production and climate regulation, which underpin life on earth (Millennium Ecosystem Assessment, 2005, United Nations, 2015). The approach applied in assessing the implications of TEMP actions utilizes the systematic approach developed in the UK to fully incorporate the role of ecosystems in supporting the delivery of ecosystem services and human well-being into decision making (UK National Ecosystem Assessment, 2011).

Four key definitions are central to the Natural Capital Approach (Natural Capital Committee, 2017), and these, as in the baseline assessment in Part One, are applied here:

- **Natural capital:** The elements of nature that directly or indirectly produce value to people, including ecosystems, species, freshwater, land, minerals, the air and oceans, as well as natural processes and functions.
- **Assets:** a distinctive component of natural capital as determined by the functions it performs, e.g. soils, freshwater, species.
- **Ecosystem services (ES):** Functions and products from nature that can be turned into benefits with varying degrees of human input.
- **Benefits:** Changes in human welfare (or well-being) that result from the use or consumption of goods, or from the knowledge that something exists.

Full details of approaches and methods are provided in Part Two of this report (Ashley et al., 2021) and the Technical Methods Report.

AIMS AND OBJECTIVES

The TEMP identified actions to address threats that adversely impact condition of designated habitat and species features within EMS. In this, Part Two report, we summarise the threats and mitigation identified by TECF (2012). We then assess the impact of the completed TEMP actions and the predicted impact of the ongoing TEMP actions on habitat and species assets and resulting influence on risk to provision of ES within the Plymouth Sound and Estuaries site, and consider wider impact in relation to first stage of the NMP (PSEC area). To inform future TEMP actions we review remaining threats to habitat and species assets within the site and highlight where actions can reduce risk to ES provision.

OBJECTIVES TO PROVIDE ASSESSMENT OF IMPACT OF TEMP ACTIONS AND PRIORITIES FOR FUTURE MANAGEMENT:

- Review the management priorities identified in the 2012-2018 TEMP and actions undertaken with TECF and Natural England to identify which actions to review impact of within the study.
- Assess change in asset status and resulting risk to provision of ES, from the 2020 baseline, under predicted impact of ongoing TEMP MPA management and partnership actions within the Natural Capital Asset and Risk Register tool.
- Identify remaining threats, future TEMP action priorities.
- Review synergies between impacts of the actions undertaken within the TEMP 'sustainable management agenda' and benefits that can enhance environment and community health and wellbeing under the aims of the proposed Plymouth National Marine Park.

METHODS

Potentially damaging activities or environmental threats, identified to be of low to high risk to habitat and species condition in the most recent TEMP were reviewed. The associated challenges, and the actions originally identified to be taken forward to address them were summarised and we assessed how application of the Natural Capital Asset and Risk Register tool can review the impact of the management and partnership actions.

The most relevant actions to be assessed within the Natural Capital Asset and Risk Register tool were selected thorough group meetings with representatives of Plymouth City Council and Natural England and University or Plymouth researchers. Actions were assessed based on availability of evidence to apply within the Natural Capital Asset and Risk Register tool and management priorities Plymouth City Council and Natural England identified would be beneficial to be considered in the asset and risk register.

Available evidence of the existing or proposed impact of management actions on extent and condition of habitat and / or species assets was included in a re-assessment of the baseline asset and risk register, presented in Report Part Two (Ashley et al., 2021). Methods to construct the new asset and risk register followed the same process as those applied to construct the baseline asset and risk register (Ashley et al., 2021).

The resulting impacts of the TEMP actions on the asset and risk register were then discussed in relation to policy targets and the wider social and economic goals of the National Marine Park. Prioritisation of remaining threats and proposed management actions were also discussed to inform future TEMPs.

RESULTS

SELECTION OF TEMP ACTIONS TO ASSESS WITHIN THE ASSET AND RISK REGISTER

Of the 10 potentially damaging activities/ challenges identified in the 2013-2018 TEMP that raised a low-medium risk or higher, habitat loss due to sea level rise and coastal squeeze was assessed to be a high risk to adversely impacting features within the European Marine Sites (Table 1). Spread of invasive non-native species was assessed by TECF (2012) to be medium-high risk. Pollution impacts on water quality from agriculture, water industry infrastructure, industry, urban run-off and historic mine waste were assessed to be medium risk (Table 1) (TECF, 2012). Dredging impacts to maintain navigation channels were identified to include medium risk from abrasion and removal of substratum as well as downstream smothering and siltation, there were also risks from disturbance of pollutants contained within estuarine and Plymouth Sound soft substratum (Table 1).

Impact of anchoring and mooring impacts on sublittoral seagrass beds and sublittoral soft substratum was also assessed as medium risk (Table 1) (TECF, 2012). Interaction of commercial fishing gear and recreational angling litter with habitat features and removal of species were assessed as low-medium risk for both activities. Risks related to coastal development and increase in urban populations were assessed as low-medium, although many related activities (eg. water quality impacts, anchoring and mooring impacts or angling litter impacts) were assessed under other threat categories (TECF, 2012).

Application of the natural capital asset and risk register to assess impacts of all activities, pressures and actions to address them were discussed in group meetings. These discussions are summarised in Table 1. In relation to data availability and presence of current management actions, assessment of impact of management actions were undertaken for the actions to address:

- Habitat loss due to sea level rise and coastal squeeze
- Invasive species
- Water Quality
- Recreation – anchoring and mooring impacts
- Commercial fishing

Table 1 Damaging activities and challenges identified in 2012 TEMP and actions identified to be undertaken 2013-2018. The actions the asset and risk register tool could be beneficial to assess were selected in meeting with PCC and NE representatives and indicated if taken forward (Y yes/N no).

Potentially damaging activity/ challenge Risk: low (green), medium (amber), high (red)	**Asset**	**Action (completed = C, ongoing = O)**	**Application of asset and risk register**	**Impact assessed in Asset and Risk Register**
Habitat loss due to sea level rise and coastal squeeze (high)	All intertidal	Quantify potential losses and gains **(o)**	Map extent of habitats in modelled loss/gain scenario, assess risk to flow of ES provision.	**Y** (only basic gain/loss summarised. Insufficient evidence of losses and gains without detailed modelling)
		Develop & implement plan for mitigating loss of habitat**. (o)**	Where mitigation has or will be undertaken, summarise change in habitats extent, condition and implications for risk to flow of provision of ESs.	**Y** (Calstock managed realignment)
Invasive species (med-high)	Intertidal and subtidal sediment habitats, intertidal rock habitats.	Survey the extent and distribution of non-native / invasive species **(c/o)**	Map extent of pressure, and extent of features in impacted condition, assess risk to flow of ES provision.	**Y**
		Implement strategically targeted control measures on species shown to have negative impacts **(o)**	Extent of area targeted by control measures.	**N** (not quantified, insufficient evidence available on long term impact of control measures)
Water Quality: Pollution from agriculture, sewage works, road runoff,	All waterbodies (subsequent impacts on habitats and species)	Strategic targeting of agri-environment schemes – monitor progress. **(o)**	Map/integrate where agri-environment schemes initialised and waterbody effected.	**N** (summary only, insufficient evidence available of current extent)

historic mine waste, discharges from industry (medium)		Monitor water quality **(o)**	Apply water quality indicators within the asset and risk register.	**Y**
		Consider impact of runoff from developments and operations on EMS and introduce measures including sustainable drainage systems and operations**. (o)**	Map/integrate where sustainable drainage systems and operations have been implemented and water body effected.	**N** (summary only, insufficient evidence available of current extent)
Shipping and Navigation – impacts of dredging (smothering, siltation, abrasion, removal, disturbance of pollutants) (medium)	Soft sediment habitats (abrasion/removal). All habitats and waterbodies (all other pressures)	Quantify scale and levels of impacts (e.g. sewage from shipping, contaminants from repairs, abandoned vessels) **(o)**	Assess impact on asset status and risk to flow of ES provision in relation to pressures quantified in the action. Assess benefit in relation to plans developed.	**N** (insufficient evidence available of current extent)
		Quantify threat caused by resuspension of contaminated sediments due to dredging and develop plan if necessary. **(o)**	Assess impact on asset status and risk to flow of ES provision in relation to pressures quantified in the action. Assess benefit in relation to plans developed.	**N** (insufficient evidence available of current extent, requires applied modelling)
Recreation – anchoring and mooring impacts (medium)	Seagrass and other key habitats or species.	Quantify scale of threats to seagrass beds and other key habitats or species due to threat of anchoring and mooring. **(c)**	-Update extent and condition maps in relation to interaction with pressures associated with anchoring and mooring. -Assess risk to flow of ES provision.	**Y** **Y**
		Identify and implement actions to limit impacts, if required. **(o)**	-Eco-mooring and awareness raising projects were undertaken by PCC. -Seeding of new seagrass habitat. -Within the asset and risk register the potential change in extent and condition of seagrass where these actions have been implemented will be modelled, and risk level to flow of relevant ESs assessed.	**Y**
Coastal Development (Low-medium)	All habitats and waterbodies	Guidance on assessing and limiting and mitigating cumulative impacts from recreational pressures. **(c)**	-Map and assess pressures from recreational activity data gathered for this action. -Assess risk to asset status and flow of ecosystem services for current level of activity and in relation to proposed mitigation.	**Y** (anchoring /mooring only) **Y** (anchoring /mooring only)
Commercial fishing (gear interaction with features or removal of species) (Low-medium)	All habitats and waterbodies	Assessment of all active fisheries within and adjacent to the SAC. Identify appropriate management actions. Review IFCA byelaws. **(c)**	-Map and assess interaction of fishing activity in relation to sensitivity of habitats to establish likely relative condition of habitats. -Assess trends in landings and status of stocks. -Map and summarise effectiveness of management actions	**Y** **Y** **Y**

			(IFCA byelaws brought in in relation to this action).	
Recreation - Angling (e.g. litter, trampling, disturbance, removal of species) (low-med)	Rock and littoral, infralittoral and sublittoral sediment habitats	Assess scale and distribution of impact of recreational angling. **(c/o)**	Map spatial intensity of angling at locations and habitats effected.	**N** (insufficient evidence available of current extent)
Recreation- Physical disturbance of roosting and feeding bird populations (low)	Avocet and Egret populations	Ensure increases in public access to waterside locations do not conflict with the needs of Avocet/Little Egret **(c/o)**	Asses levels of activity/visits in relation to bird populations roosting and feeding grounds.	**N** (insufficient evidence available of current extent)
Awareness (not assessed)	Low awareness of the site's environmental value and sensitivity	Develop understanding of the EMS site's environmental value through targeted education and interpretation efforts. **(o)**	Record number of events and effectiveness. Record educational materials produced.	**N** (insufficient evidence available from recent events)

ASSET REGISTER – FORECAST UNDER COMPLETED AND ONGOING TEMP ACTIONS

Table 2 summarises the estimated impact of completed and ongoing actions on habitat assets within Plymouth Sound and Estuaries SAC and NMP Stage 1. Full review of ongoing actions and their forecast impact on the asset and risk register are provided in Annex I, impact of completed actions is assessed in Report Part Two (Ashley et al., 2021). Key points are:

Adverse impacts addressed by completed and ongoing TEMP 2013-2018 actions

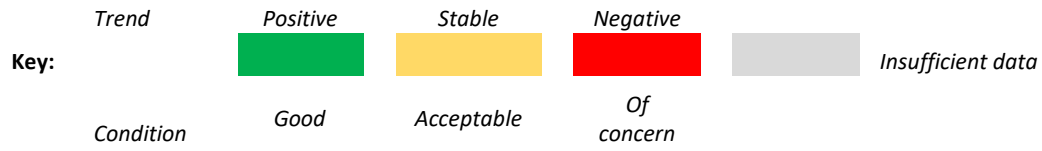
- IFCA byelaws prohibiting bottom towed fishing areas in MPAs (EMSs) have ensured adverse impacts are reduced to infralittoral and circalittoral reef habitats. Although, monitoring of condition and impact of litter from recreational angling is still required (Table 2).
- Actions to reduce pressure from anchoring and mooring on subtidal seagrass beds and trials to re-seed beds at Jennycliff potentially increase extent and reduce adverse impacts on asset condition. Further monitoring of condition and continued awareness raising activities to change boat operator behaviour are still required (Table 2).
- Coastal realignment projects, such as those at Calstock increase extent of reed bed habitats and reduce future social and economic impacts from flooding and sea level rise (Table 2).
- Actions to address diffuse and point source pollution from both agriculture, water company infrastructure and domestic/urban sources have provided a route to address water quality challenges. Continued funding and expansion of these projects, as well as monitoring of effectiveness, is required to reach WFD targets. Impact of climate change scenarios are important to consider, as surface water flooding is predicted to occur more frequently (Table 2).

Continued adverse impacts on assets and relevant ongoing 2013-2018 TEMP actions to address those impacts:

- Continued pressure on subtidal soft substratum habitats from physical abrasion related to fishing activity outside MPAs and anchoring and mooring impacts inside MPAs, continue to adversely impact asset condition.
- Greater awareness raising activities targeting the recreational boat user community under REMEDIES and PCC projects will potentially limit pressure on subtidal soft substratum habitats but future monitoring of change in behaviour and monitoring of habitat condition, to assess effectiveness, will be required.

- Subtidal mud, mixed, and coarse soft substratum habitat will also continue to be adversely impacted as current or ongoing actions do not address spread of invasive non-native slipper limpet *Crepidula fornicate* Environment Agency work remains ongoing that addresses source of high levels of sediment contaminants.
- Intertidal soft substratum habitats and biogenic reefs (mussel beds) remain unlikely to meet targets in MPAs to reduce spread of invasive non-native species, although confidence is limited. Reports of trials of methods to reduce spread indicate some success at reducing density that may limit spread but methods are unlikely to remove presence of invasive non-native species.
- Intertidal rock habitats in the Yealm are likely to continue to be adversely impacted by contaminants including TBT**.**
- Water quality ecological status is forecast to display a positive condition trend, due to land management actions to address diffuse pollution due to run-off from agriculture (eg 'Upstream Thinking' and other Tamar Catchment Partnership projects).
- Actions in the current TEMP are unlikely to address overall water body status challenges, to meet WFD targets. Combined nutrient and biological and chemical contaminant impacts remain a challenge. For instance, point and diffuse pollution from water industry assets, agriculture and domestic/urban sources, as well as contamination from mining and quarrying. Water quality pressures from these sources remains a priority challenge/pressure to address in future TEMPs.
- Monitoring effectiveness of actions to improve water quality, applying indicators identified by Environment Agency (2021) review of WFD tools, combined with Natural Capital assessments will provide greater confidence in water body status and condition. This will also improve confidence in assessment of water quality on habitat and species assets and health impacts for recreational activities.

Table 2 Estimated impact of ongoing TEMP actions on extent and condition of marine habitat assets in Plymouth Sound and Estuaries SAC and NMP Stage 1 (PSEC area), including summary of impact on 10 year trend (where data available). <Extent represents habitat assets that are estimated to decline in extent, **Extent** represents habitat assets that are estimated to increase in extent.



Broad Habitat	Detail (with Eunis code)	Extent (km²)	Extent trend	Condition	Condition trend
Marine inlets and transitional waters					
Intertidal reef	Littoral rock and other hard substrata (A1)	2.12			
Intertidal sediments	Littoral coarse sediment (A2.1)	0.16			
	Littoral sand and muddy sand (A2.2)	<5.98			
	Littoral mud (A2.3)	<20.85			
	Littoral mixed sediment (A2.4)	0.52			
	Coastal saltmarshes and saline reedbeds (A2.5)	**0.51**			
	Littoral sediments dominated by aquatic angiosperms (seagrass bed) (A2.6)	0.43			
	Littoral biogenic reefs (Blue mussel beds) (A2.7)	0.2			
Sublittoral habitats					
Subtidal reef	Infralittoral rock and other hard substrata (A3)	9.24			
	Circalittoral rock and other hard substrata (A4)	15.32			
Subtidal sediment	Sublittoral coarse sediment (A5.1)	84.54			
	Sublittoral sand (A5.2)	45.97			
	Sublittoral mud (A5.3)	14.27			
	Sublittoral mixed sediments (A5.4)	83.87			
	Sublittoral macrophyte dominated sediment (A5.5)	**0.44**			
	Sublittoral biogenic reefs (Mussel beds) (A5.6)	0.02			
Water bodies (combined)	Overall water body status	284.29			
	Shellfish waters				
	Bathing waters				

RISK REGISTER – FORECAST UNDER COMPLETED AND ONGOING TEMP ACTIONS

Of the 10 potentially damaging activities / challenges identified in the 2013-2018 TEMP, at low-medium risk or higher, 1 action to mitigate challenges is complete and 9 are ongoing or evidence of impact are unavailable (Table 1). In this section the impact of ongoing as well as completed TEMP actions on the baseline asset and risk register are assessed (Table 2, Figure 3, Supplementary Material I). Where evidence on impact on condition or spatial extent from ongoing actions is available, this is quantified within the assessment (Table 2, Figure 3, Supplementary Material).

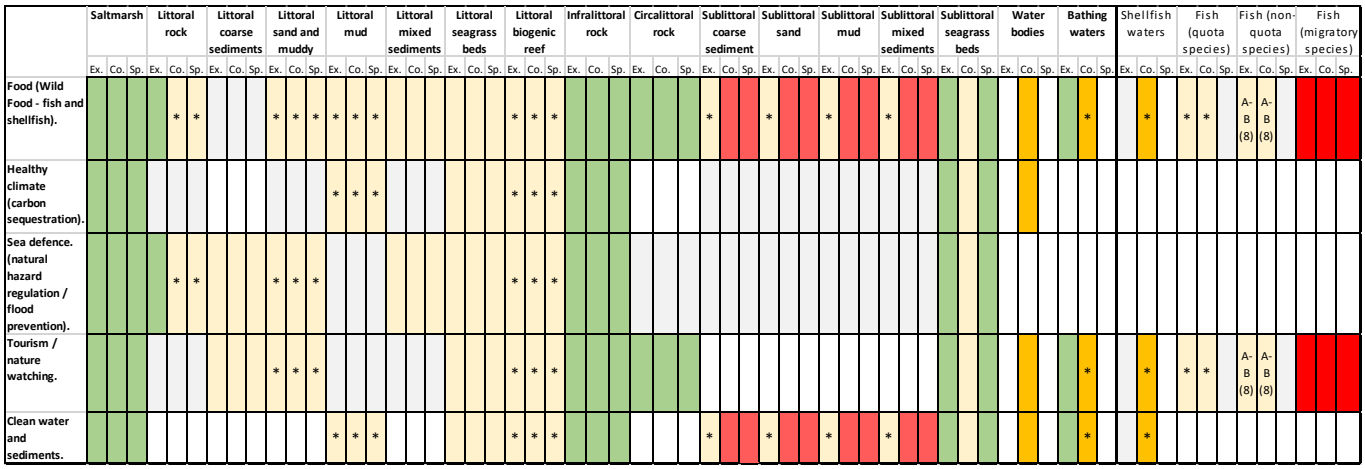


Figure 3 Priority relationships assessed in the risk register. The assets are columns and the benefits in rows. For each ES the top row is risk assessed through analysis of indicator data in relation to policy targets. The colour of the cell shows the risk rating for the asset status quantity (Qun), quality/condition (Qul), spatial configuration (Sp) based on the scoring matrix (Supplementary Material I). Red indicates it is at high risk, amber at medium risk (*amber cells with an asterisk, indicate asset status is below target and the trend in status is declining, suggesting risk rating is close to moving to the high risk category), green risk ratings are at low risk. Lighter shaded, red, amber or green cells indicates RAG risk rating where there is less confidence (greater uncertainty) in the risk rating, due to limited evidence and/or limited agreement between evidence sources (e.g. modelled habitat data). The light shading for commercial fish species indicates a RAG assessment based on an assessment of data at a spatial scale greater than the case study area. The grey cells indicate asset- benefit relationships, which provided a low contribution of the asset to the benefit, or limited information to make an assessment. White cells represent negligible asset-benefit relationship.

Actions to '*address commercial fishing gear interaction with features or removal of species*' had been completed within the time period assessed in the baseline risk register (Annex I). IFCA byelaws were implemented in MPAs to reduce pressure identified in IFCA HRA assessments on subtidal habitats from bottom towed fishing gear (Curry et al., 2017), continuing to enable low risk to provision of ES from infralittoral and circalittoral reef features. The following impact on ES risk components were identified within the risk register, assessed in relation to predicted outcomes of ongoing TEMP actions:

- 10 components related to sublittoral seagrass move from high to low risk in relation to extensive mitigation activity introduced through the REMEDIES project (Supplementary Material I, Tab 5; Tab 6) (Table 2, Figure 3).
- 5 components move from high to medium risk related to improved condition of sublittoral seagrass beds related to reduced anchoring and mooring impacts, although potential continued risk from nutrient enrichment causes medium rather than low risk. 4 components related to water quality move from high to medium risk, related to projects targeting reducing run-off from agriculture and developments to water courses and diffuse and point source pollution from both agriculture and domestic/urban sources. The predicted outcomes of the same actions were assessed to reduce risk from medium* (*at greater risk to declining to high risk) to medium risk for 9 components relating to bathing water and shellfish water quality (Table 2, Figure 3).

- 25 components related to littoral sediment habitats move from medium* to medium risk category, due to proposed impact of awareness raising of anchoring and mooring impacts and improved monitoring and removal activities for invasive Pacific oyster populations.
- 22 components remained identified in the highest risk category (red cells), due to continued interaction of sublittoral soft substratum habitats with physical and chemical pressures, inside and outside MPAs and pressures on Atlantic salmon and European eel stocks. However, this provided a reduction of 13 components in the high risk category, compared to the baseline risk register (Table 2, Figure 3).

High risk to ES benefits from sublittoral coarse, sand, mud and mixed sediment habitats were assessed due to continued elevated sediment contaminant levels, spread of non-native invasive species (slipper limpet) populations and interactions with anchoring, mooring and dredging inside MPAs. Continued potential interaction with physical pressures related to fishing activity, outside MPAs contributed to sublittoral soft substratum habitats not meeting policy targets outside MPAs (Supplementary Material I).

45 habitat components were assessed in medium* risk (at greater risk of declining to high risk category), even under ongoing TEMP actions. However this is a reduction of 24, from 69 components in the baseline risk register. Assessment identified that extent and condition of littoral sand and muddy sand, littoral mud and mussel beds remain negatively impacted by spread of non-native Pacific oyster populations and elevated contaminant levels (Supplementary Material I).

The risks are summarised as:

- **Food (wild food fish and shellfish)** remains at high risk due to the extent of sublittoral soft substratum habitat without management objectives and with impaired quality (condition) based on evidence of previous fishing activity. The condition of important fish and shellfish nursery habitat (seagrass beds, littoral rock and sediment habitats) is predicted to improve under ongoing TEMP actions, reducing overall risk compared to the current risk register. Shellfish waters remain impaired in relation to elevated contaminant levels.
- **Healthy climate benefits** improve from high to medium risk due to the ongoing actions to increase extent and condition of littoral and sublittoral seagrass habitats, although moderate to high risk still exists where littoral mud and mussel bed habitats remain in degraded condition. Sublittoral soft sediment habitats provide a lower contribution to healthy climate benefits but over a much greater spatial scale. Degraded quality of these habitats is likely to continue to present risk to delivery of healthy climate benefits, even under ongoing TEMP actions.
- **Sea defence services** provided by littoral habitats and sublittoral seagrass move from high to medium risk, due to ongoing restoration of extent and condition of seagrass habitats.
- **Recreation and tourism benefit** risk is reduced due to ongoing TEMP actions to reduce pressures on littoral and sublittoral seagrass beds and increase bed extent. Medium risk is still present, due to degraded littoral rock and soft substratum habitats, as well as incidences of poor water quality.
- **Clean water and sediments** supported by the ecological functions and processes in littoral mud, mussel beds and the subtidal sediment are considered to be at risk due to continued impaired quality (condition) of these habitat assets. Water body status remains below target due to elevated chemical contamination and likelihood of incidences of poor water quality due to high levels of bacterial contamination.

Risk to ES benefits related to contribution from saltmarsh habitats continues to be low. Managed realignment projects may further restore extents, recorded to have decreased since long-term historical baseline (1860s) (EA, 2021) (Supplementary Material I, Tab 5; Tab 6). Likewise, risk to ES benefits. Intralittoral and Circalittoral reef habitats contribute to also remains low. Reef habitats remain in maintain/favourable condition within MPAs, although outside MPAs, 0.12km² and 0.8km² respectively (1.3% and 0.5% of total extent), are likely to

continue to be in impaired condition related to historical and current interaction with pressures related to fishing activity (Supplementary Material I).

Limited recent monitoring forces these assessments to rely on a precautionary approach related to modelled interaction between pressures and habitat sensitivity. Both reef and saltmarsh habitats are likely to continue to provide at, or just below, expected contribution to all ES benefits assessed (Figure 3, Supplementary Material I). Updated monitoring of condition of saltmarsh, infralittoral and circalittoral reef habitats is required to improve confidence in the assessment.

SUMMARY- REMAINING THREATS AND TEMP ACTION PRIORITIES

The actions in the current TEMP have reduced risk to ES provision from specific habitat assets, however, challenges remain from pressures effecting water quality and sea level rise scenarios, that effect condition of all habitats and provision of all ES benefits.

In summary benefits have occurred in relation to the following activities:

- IFCA byelaws have reduced impacts on subtidal reef and soft substratum habitats in MPAs from bottom towed gear fishing activity.
- REMEDIES project activities reduce anchoring and mooring pressures on seagrass.
- Coastal realignment projects have also provided addition of reed bed habitats.

However, adverse impacts remain to all habitats and species within MPAs from:

- Reduced water quality.
- Predicted long term risks from sea-level rise.
- Increase in pressures related to coastal development and recreational activities.
- Spread of invasive non-native species.
- Outside MPAs sublittoral soft sediment habitats and related ES benefits of healthy climate, clean water and sediment and food related to habitats supporting commercially targeted species may still be adversely impacted from demersal fishing activity ad anchoring and mooring impacts

Table 3 addresses the remaining challenges/threats and suggests TEMP action priorities for consideration in the future TEMP, moving forward at the time of writing.

Table 3 Remaining damaging activities and challenges and suggested actions to consider in the future TEMP, and implications of suggested actions on natural capital, ES benefits and environment and community health and wellbeing.

Potentially damaging activity/ challenge Risk: low (green), medium (amber), high (red)	**Asset**	**Action**	**Direction (+ / -) of impacts on marine natural capital assets and ES benefits**	**Impacts on environment and community health and wellbeing**
Habitat loss due to sea level rise and coastal squeeze (high – longer term risk)	All intertidal	Map extent of habitats in modelled loss/gain scenario, assess risk to flow of ES provision.	**Assessment tool required:** Identify gains and loss of habitat assets and related ES benefits. Identify where coastal squeeze barriers prevent habitat migration.	Assessment tool: • Identify where recreational and commercial activities are impacted. • Identify where infrastructure, property and businesses are impacted.
		Plan for mitigating loss of habitat. Implement coastal realignment projects	- Loss of intertidal habitats. + Potential benefits from coastal realignment for reed bed and saltmarsh	• Mitigation reduces loss of access for recreational activities.

			habitat extents and related ES.	• Increases nature watching and education opportunities. • Negative impacts on infrastructure, property and businesses may be reduced.
Water Quality: Pollution from agriculture, sewage works, road runoff, historic mine waste, discharges from industry (high – short to long term)	All waterbodies (subsequent impacts on habitats and species)	Continued targeting of agri-environment schemes – monitor progress.	+ Reduce nitrogen, phosphorus, and organic pollutants impacts on water body and habitat condition. + Supports all ES benefits.	• Increase access for recreational activities, support health and wellbeing benefits. • Increase opportunity to interact with healthy habitats.
		• Target sewage misconnections and septic tank inputs, discharges from sewage treatment works and combined sewer overflows. • Introduce measures including sustainable drainage systems and operations.	+ Reduces impacts on water body and habitat condition. Supports all ES benefits.	• Restore shellfish water status. • Reduce health risks humans. • Improve access to recreational activities. • Support designation of bathing waters in higher estuaries. • Encourage interaction with natural environment.
		• Monitor water quality, apply WFD indicators identified by EA (2019) to assess impact of actions on natural capital assets. • Monitor progress of Upstream Thinking projects in Upstream Thinking Portal	**Assessment tool required**: Identify impact of actions on natural capital assets and implications for ES benefits.	• Assessment tool: Identify progress. • Identify locations providing healthy habitats and water bodies to support human activities.
Awareness and responsible access (high in respect to reducing recreational activity pressures and improving environment and community wellbeing)	Low awareness of the site's environmental value and sensitivity	• Develop understanding of the site's environmental value through targeted education and interpretation efforts. • Develop measures such as voluntary codes of conduct • Enable access and awareness of sites. • Develop ocean literacy tools, interactive displays, guided events and interaction with habitats and species – eg. walks, paddle tours and glass bottom boats.	+ Benefit extent and condition of habitats and provision of ES benefits through reduction of pressures associated with recreational activities.	• Increase awareness of natural environment, benefits from interaction and and how to access it responsibly. • Improve access and availability to all socio economic status groups.
Invasive species (medium)	Intertidal and subtidal sediment habitats, intertidal rock habitats.	Monitor change in the extent and distribution of non-native / invasive species.	**Assessment tool required:** Identify gains and loss of habitat assets and related ES benefits.	Assessment tool: Identify where human activities are impacted.

		Implement strategically targeted control measures proved effective by current trials – *M.gigas*.	+ Reduce spread and density in existing locations, maintain extent and condition of native habitats and ES benefits.	• Improve safe access to slip ways, shorelines and intertidal habitats. • Increase opportunity to interact with native habitats.
Shipping and Navigation – impacts of dredging (smothering, siltation, abrasion, removal, disturbance of pollutants) (medium)	Soft sediment habitats (abrasion/removal). All habitats and waterbodies (all other pressures)	• Quantify scale and levels of impacts (e.g. sewage from shipping, contaminants from repairs, abandoned vessels). See Water Quality.	**Assessment tool required:** Impact on asset status and risk to flow of ES provision in relation to pressures quantified in the action. Assess benefit in relation to plans developed.	• Increase access for recreational activities, support health and wellbeing benefits. • Increase opportunity to interact with healthy habitats.
		• Quantify threat caused by resuspension of contaminated sediments due to dredging and develop plan if necessary. See Water Quality.	**Assessment tool required:** Impact on asset status and risk to flow of ES provision in relation to pressures quantified in the action. Assess benefit in relation to plans developed.	• Maintain access for shipping, ferries and naval vessels, supporting employment and industries. • Increase opportunity to interact with healthy habitats. • Improve access to water bodies meeting WFD targets for contaminants.
Coastal Development (medium)	All habitats and waterbodies	• See Water Quality related to improving sewage infrastructure and limiting run-off. • See Awareness and Responsible Access. • See Habitat Loss to Sea Level Rise and Coastal Squeeze.	+ Reduce risk to asset status and flow of ecosystem services through recreation mitigation activities and improvement to sewerage drainage systems and operations.	• Increase access for responsible recreational activities, support health and wellbeing benefits. • Increase opportunity to interact with healthy habitats. • Negative impacts on infrastructure, property and businesses may be reduced.
Recreation – anchoring and mooring impacts (medium)	Seagrass and other key habitats or species.	• Monitor effectiveness of eco-moorings, re-seeding of beds, and awareness raising activities to reduce anchoring and mooring impacts. • Expand successful mitigation eg. eco-moorings, awareness raising activities and / or re seeding.	+Improve seagrass extent and condition and all key ES. -Potential displacement of anchoring activity onto other sublittoral soft substratum habitats.	• Increase opportunity to interact with healthy habitats. • Reduces risk to ES benefits that provide sea defence and healthy climate benefits supporting wellbeing.

Commercial fishing (gear interaction with features or removal of species) (Low-medium)	All habitats and waterbodies	• Assessment of all active fisheries within and adjacent to the SAC – interaction with habitat features. • Monitoring of trends in landings per unit effort at regional scale relevant to site – shellfish and non quota species. • Develop Fisheries Research & Management Plans for key species interacting with the site and supporting fishing fleets in Plymouth and wider south west Devon and south east Cornwall region.	+ Integrate improvement of habitat extent and condition with benefits to species populations supporting ES benefit 'food'.	• Support economic activity and food supply. • Promote job opportunities in fishing, processing and restaurants. • Increase abundance of species of interest to recreational activity (eg. angling, diving).
Recreation - Angling (e.g. litter, trampling, disturbance, removal of species) (Low-medium)	Rock and littoral, infralittoral and sublittoral sediment habitats	• Assess scale and distribution of impact of recreational angling. • See Awareness Raising.	+ Reduce pressures and improve habitat condition.	• Increase opportunity to interact with healthy habitats. • Support economic activities related to angling.
Recreation- Physical disturbance of roosting and feeding bird populations (Low)	Avocet and Egret populations	Ensure increases in public access to waterside locations do not conflict with the needs of Avocet/Little Egret	+Reduce pressures on avocet and Egret populations.	Aid presence of species supporting wildlife watching opportunities and interaction with natural environment.

Trend in condition of water body assets has continued to decline. Although it is acknowledged chemical sampling has only occurred in a subset of water bodies, and the classification has been extrapolated across non-monitored waterbodies. As new standards have been used in the 2019 WFD classification the same waterbody may show failures where a water body may previously have been classified as good chemical status (Environment Agency, 2019; Natural England, 2021). Chemical contamination from historic mining is, however, likely to continue. Nutrient inputs, and bacterial contamination from agricultural run-off and from water company infrastructure also remain a risk.

Water quality related to agricultural run-off is expected to improve in the long term, although further investment to support the Tamar Catchment Partnership activities will be important to secure benefits (WCT and Tamar Catchment Partnership, 2021, Tamar Catchment Partnership, 2012). Projects undertaken by the Tamar Catchment Partnership have taken many steps to address existing challenges, and benefits are likely to be seen in longer time scales than under the current assessment.

Continuation of water industry infrastructure improvements, such as those made since 2000 to address continuous and intermittent discharges in the Tamar catchment, driven by the Shellfish Waters Directive, are required, to benefit water quality status. Beneficial actions include those taken since 2000 to introduce UV disinfection, secondary treatment and screening (Natural England, 2021, Langston et al., 2003).

Improving water quality provides win-win-win benefits to condition of all estuarine and marine habitats and species as well as ensuring recreational access, and associated health and wellbeing benefits to people are provided in the site (Figure 3, Table 3).

Awareness raising

Greatest opportunity to address challenges to natural capital asset condition and to also meet NMP aims is potentially through awareness raising and behaviour change. For residents and visitors, and those interacting with marine natural capital assets for recreational or commercial use, a greater appreciation of the value of the natural habitats and species within the site and the implications of both negative and positive actions on the system has the potential to promote environmentally responsible behaviours (Wyles et al., 2019, Pahl and Wyles, 2017, Hartley et al., 2015, Wyles et al., 2017, Brennan et al., 2019). Addressing actors at all levels from general public through to businesses, industry and governance actors, and ensuring all socio economic status groups are reached is important.

To achieve NMP goals a large scale, multi tool, long term multi-year suite of education, awareness raising and facilitation for access for all socio economic status groups will provide benefits, in combination with actions presented in the TEMP to fulfill statutory duties related to EMS (MPA) management.

Monitoring

Monitoring to assess change in extent and condition of assets remains vital to identifying progress towards policy goals within the asset and risk register. Monitoring is also vital in assessing effectiveness of actions to address challenges identified in the TEMP.

For instance, tracking progress of actions to address water quality benefits resulting from specific project such as targeting of argi-environment schemes within South West Water and Tamar Catchment Partnership's Upstream Thinking projects and extent of habitat and water body assets benefitting from actions is important to monitor (WCT and Tamar Catchment Partnership, 2021, Environment Agency, 2021, South West Water, 2021). An important tool going forward for monitoring progress of Upstream Thinking projects is the Upstream Thinking Portal, created with support from the Centre for Resilience in Environment, Water and Waste (CREWW) at the University of Exeter, funded by the NERC SWEEP programme (SWEEP, 2021).

Continued monitoring that records extent and condition of habitat, water body and species assets is vital. For instance to track response of adversely impacted habitats, such as seagrass beds, to actions to reduce anchoring and mooring pressure and improve water quality (Bunker and Green, 2020, Natural England., 2019). Both to assess effectiveness of mitigation and management actions and to inform future condition monitoring and asset ad risk registers.

Monitoring is also important to assess flow of ES benefits from habitat assets. Commercially targeted species such as bass utilise multiple habitats in the site at different life stages (Doyle et al., 2017, Pawson et al., 2008, Pawson et al., 2007, Stamp et al., 2021, Crossin et al., 2017). Monitoring condition of habitats in relation to fish species community in nursery habitats such as seagrass and intertidal rock and soft substratum habitats provides indication of contribution to supporting species stocks (ES benefit wild food) (Stamp et al., 2021, Crossin et al., 2017, Environment Agency, 2021).

Greater confidence in evidence on condition of sublittoral soft substratum habitats is required due to current lack of evidence in extent and condition outside MPAs. Current assessment through modelled Likely Relative Condition (LRC) applied in baseline monitoring is based upon poor quality habitat condition data and takes a precautionary approach (Technical Methods Report) (Ashley et al., 2021). The LRC approach is likely to overestimate sensitivity of habitat communities to pressures and also overestimate area of fishing grounds used by active vessels.

Monitoring infauna communities in subtidal soft substratum habitats can provide indicators of communities indicating disturbed, stressed or adversely impacted habitats (Borja et al., 2000, Queirós et al., 2013, Dernie et al., 2003, Gray and Elliott, 2009). Infauna community data also provides indication of presence of contaminants related to species traits (Elliott et al., 2017, Borja et al., 2000, Queirós et al., 2013, Watson et al.,

2018) and identification of presence of communities with traits to aid remediation of pollutants (Elliott et al., 2017, Borja et al., 2000, Queirós et al., 2013, Watson et al., 2018). In turn, greater accuracy in spatial effort data related to fishing activity and anchoring and mooring data is also required to improve accuracy of assessments of impact of activities on infauna communities.

Within shallow coastal and estuarine environments application of Environment Agency's Water Framework Directive monitoring tools (Environment Agency, 2021), including infauna community monitoring, within Natural Capital Approaches, such as Asset and risk Register will provide important evidence and links to indicator metrics going forward.

IMPACT OF COMPLETED AND ONGOING TEMP ACTIONS ON AIMS OF THE PLYMOUTH NATIONAL MARINE PARK

Plymouth National Marine Park is not intended as an additional biodiversity conservation designation, but instead as a social policy innovation to enhance the economic, environmental and social values of Plymouth Sound (Plymouth City Council, 2019). The concept relates to that of a city marine park stated by Pittman et al. (2019), as an innovative blue urban social policy for enabling, empowering and deepening citizen relationship with the city seascape. Pittman et al., (2019) identify the role of a city park enables potential to address multiple interlinked sustainable development goals (SDGs) (Figure 4). The focus of a city marine park relates directly to 'achieving good health and wellbeing' (sustainable development goal (SDG) 3) (UNDP, 2021, United Nations, 2015, United Nations, 2018). Ultimately, multiple SDGs linked to marine natural capital assets, and particularly, 'achieving good health and wellbeing', depend on SDG 14 (conserve and sustainably use the oceans, seas, and marine resources) (UNDP, 2021, United Nations, 2015, United Nations, 2018, Depledge et al., 2019, Claudet et al., 2020). Maximising the intended benefits of Plymouth National Marine Park will, thereby, rely heavily on the success of completed, ongoing and future TEMP actions to support extent and condition of marine natural capital assets.

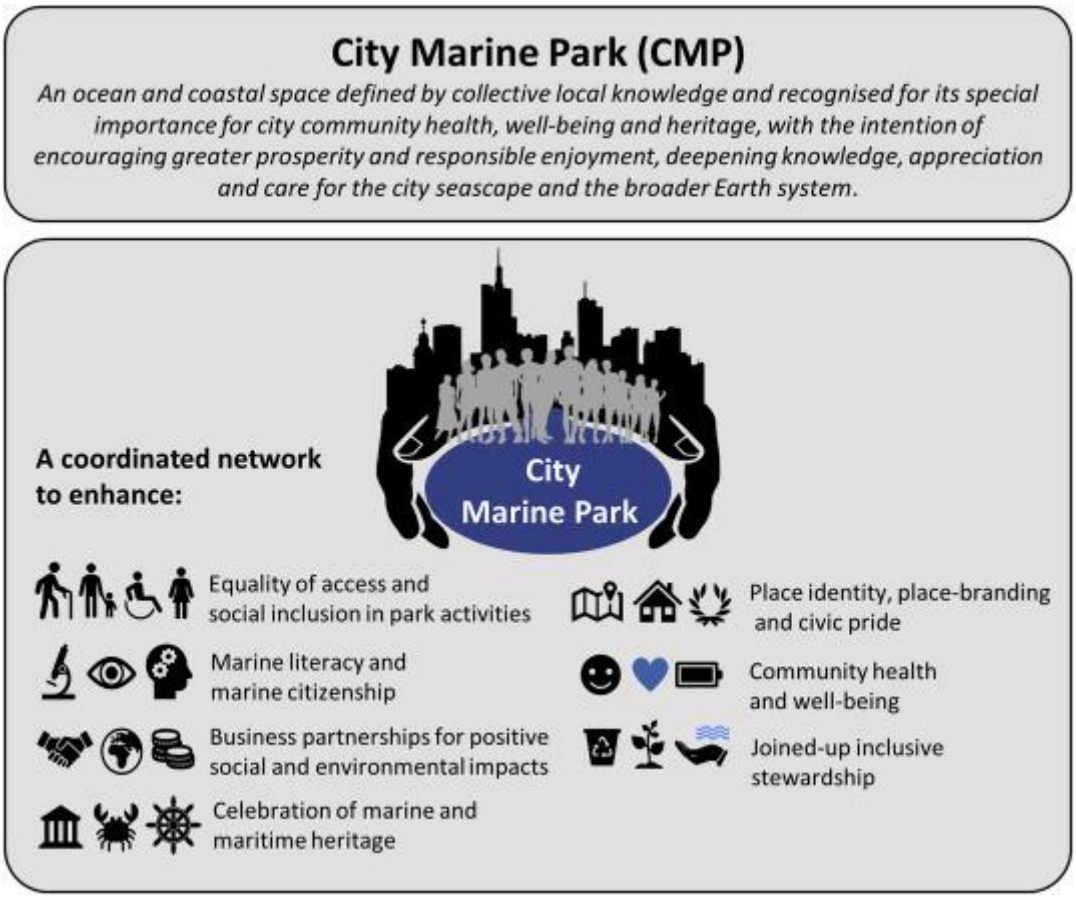


Figure 4 Interlinked sustainable development goals (SDGs) potentially enabled by the implementation of a city park (from Pittman et al., 2019)

The 17 sustainable development goals (SDGs) were established within the 2030 Agenda for Sustainable Development and aim to seek to end poverty and other deprivations while improving health and education, reducing inequality, spurring economic growth, tackling climate change and preserving our shared ocean and its resources (UNDP, 2021, United Nations, 2015, United Nations, 2018). The United Nations revised roadmap for the "decade of ocean science for sustainable development" (Claudet et al., 2020, UNESCO, 2018) provides a unifying framework across the UN system to enable countries to achieve all of their ocean-related Agenda 2030 priorities. Existing TEMP actions potentially enhance all of the 6 societal outcomes identified in The United Nations revised roadmap for the "decade of ocean science for sustainable development" (UNESCO, 2018). Combined with assessment of indicators within the NCARR, progress towards these broad outcomes can be monitored and reviewed.

The first societal outcome: ***A clean ocean*** *whereby sources of pollution are identified, quantified and reduced and pollutants removed from the ocean* (United Nations, 2018, p7), is currently approached by TEMP actions to reduce pollution from agriculture, sewage works, road runoff, historic mine waste, and discharges from industry.

The second societal outcome: ***A healthy and resilient ocean*** *whereby marine ecosystems are mapped and protected, multiple impacts, including climate change, are measured and reduced, and provision of ocean ecosystem services is maintained* (United Nations, 2018, p8), is approached by a combination of management actions for species, habitats and features, such as recreational mooring and anchoring impacts on seagrass beds, and mapping and monitoring of indicators within the NCARR.

The third societal outcome: ***A predicted ocean*** *whereby society has the capacity to understand current and future ocean conditions, forecast their change and impact on human wellbeing and livelihoods* (United Nations, 2017, p8), is approached by sea level rise predictions and modelling of impact of storm events, and prediction of habitat loss due to sea level rise and coastal squeeze in the NCARR and TEMP.

The fourth societal outcome: ***A safe ocean*** *whereby human communities are protected from ocean hazards and where the safety of operations at sea and on the coast is ensured* (United Nations, 2018, p8), is approached by prediction of sea level rise and storm risk, risk assessment and coastal realignment and habitat creation actions.

The fifth societal outcome: ***A sustainably harvested and productive ocean*** *ensuring the provision of food supply and alternative livelihoods* (United Nations, 2018, p9), is approached by assessment supporting IFCA byelaws and LRC assessment within the risk register assessing commercial fishing gear interaction with habitats or removal of species. Actions to improve water quality and condition of habitats supporting life stages of commercially targeted species will also improve access to aquaculture and wild food resources.

The sixth societal outcome: ***A transparent and accessible ocean*** *whereby all nations, stakeholders and citizens have access to ocean data and information, technologies and have the capacities to inform their decisions* (United Nations, 2018, p9), is approached by the initial publication of the TEMP and stakeholder consultation within partners projects to achieve actions. Specifically though, it is the broad ocean literacy, awareness raising actions that stand to contribute to this outcome. Awareness raising in the agriculture sector and on pollution impacts and outreach and education initiatives to limit and mitigate cumulative impacts from recreational pressures, combined with increases in public access are likely to be key. Access to a healthy marine environment is essential to health and wellbeing, but to ensure increased access is sustainable, awareness raising and education actions enable all citizens and stakeholders to have a more responsible and informed behaviour towards the ocean and its resources (United Nations, 2018).

Whilst the actions within the TEMP focus on addressing joint delivery of statutory duties for management of MPAs, the dual aim to deliver wider social and economic gains through the actions, thereby, provides beneficial links to achieving SDGs (TECF, 2012; Pittman et al., 2019; United Nations, 2018). Assessing risk to natural capital asset condition and subsequent ES benefits, within the natural capital asset and risk register, provides a means to monitor progress, not only towards biodiversity goals, but also progress towards the social and economic gains of actions. These actions, and subsequent monitoring of progress and delivery of benefits are, thereby, translatable into strategies to achieve aims of a city marine park, and the synergies with strategies to achieve wider SDGs. Table 4 provides a summary of the impact of completed and ongoing TEMP actions on aims of the proposed Plymouth National Marine Park. The table relates TEMP actions, progress assessed in the NCARR and role within PNMP aims in the context of results that approach societal outcomes within the decade of ocean science for sustainable development (Table 4).

Table 4 Summary of the impact of completed and ongoing TEMP actions on aims of the proposed Plymouth National Marine Park

Potentially damaging activity/ challenge Risk: low (green), medium (amber), high (red)	➢ **Action identified** • **TEMP action assessed.**	**Impact on enhancing environment and community health and wellbeing under the aims of the proposed Plymouth National Marine Park.**
Habitat loss due to sea level rise and coastal squeeze (high)	➢ Plan for mitigating loss of habitat. • Coastal realignment and habitat creation.	• Increases nature watching opportunities. • Reduces flooding risk to property and businesses. • Increases carbon storage potential. • Mitigates loss/Increase habitats supporting commercial and recreational fisheries.

Invasive species (med-high)	➢ Implement strategically targeted control measures on species shown to have negative impacts. • Trialling removal methods. • Trialling economic uses of removed oysters.	• Improves shoreline access, reduces injury hazards to recreational activities on shoreline. • Improves condition of habitats supporting species of commercial and recreational interest. • Potentially creates economic opportunities from use as fertiliser or food.
Water Quality: Pollution from agriculture, sewage works, road runoff, historic mine waste, discharges from industry (medium)	➢ Strategic targeting of agri-environment schemes – monitor progress. • Awareness raising. • Interventions such as farmyard and farmed land improvements. ➢ Consider impact of runoff from developments and operations and introduce measures including sustainable drainage systems and operations. • Prevention of run-off entering water courses. • Address sewage misconnections and septic tank inputs to prevent these contaminant sources impacting water courses. • Reduce impacts from post-industrial metal mining (passive treatment systems or revegetation).	• Increases recreation access to clean waters. • Reduces health risks from recreational activities. • Increases wild food collection opportunities. • Increases economic opportunities from aquaculture. • Improves condition of waterbodies and habitats supporting species of commercial and recreational interest. • Actions still needed to address CSO discharges.
Coastal Development (Low-medium)	➢ Guidance on assessing and limiting and mitigating cumulative impacts from recreational pressures. • Recreational anchoring and mooring mitigation. • Awareness raising.	• Maintain habitats to support sustainable recreational activity. • Increases carbon storage potential. • Mitigates loss/Increase habitats supporting commercial and recreational fisheries. • Increases nature watching opportunities. • Increase opportunity and motivation to interact with natural/blue environment.
Commercial fishing (gear interaction with features or removal of species) (Low-medium)	➢ Identify appropriate management actions. ➢ Review IFCA byelaws. • IFCA byelaws introduced	• Maintain habitat to support sustainable fishing activity. • Maintain habitats to support sustainable recreational activity. • Increases carbon storage potential.
Shipping and Navigation – impacts of dredging (smothering, siltation, abrasion, removal, disturbance of pollutants) (medium)	➢ Quantify scale and levels of impacts (e.g. sewage from shipping, contaminants from repairs, abandoned vessels). ➢ Quantify threat caused by resuspension of contaminated sediments due to dredging and develop plan if necessary. • Modelling of siltation at offshore dredged material disposal sites.	• Maintain habitats to support sustainable recreational activity. • Maintain habitat to support sustainable fishing activity. • Increases carbon storage potential. • Maintain water quality, supporting recreational activity and opportunity to interact with blue environment.
Recreation – anchoring and mooring impacts	➢ Quantify scale of threats to seagrass beds and other key habitats or species due to threat of anchoring and mooring. • Monitoring anchoring and mooring levels. • Habitat condition assessment. ➢ Identify and implement actions to limit impacts, if required. • Restoration project at Jennycliff. • Eco-mooring trials at Cawsand. • Outreach and education initiatives. • Signage and information boards.	• Maintain habitats to support sustainable recreational activity. • Increases carbon storage potential. • Mitigates loss/Increase habitats supporting commercial and recreational fisheries. • Increases nature watching opportunities. • Increase opportunity and motivation to interact with natural/blue environment.
Recreation - Angling (e.g. litter, trampling, disturbance, removal of species)	➢ Assess scale and distribution of impact of recreational angling.	• Maintain habitats to support sustainable recreational and economic activity. • Raise awareness of benefits provided by seas and estuaries. • Increase facilities and access to take part in recreational activities.
Recreation- Physical disturbance of roosting and feeding bird populations	➢ Ensure increases in public access to waterside locations do not conflict with the needs of Avocet/Little Egret.	• Maintain nature watching opportunities. • Raise awareness of benefits provided by seas and estuaries.

Awareness	➢ Develop understanding of the EMS site's environmental value through targeted education and interpretation efforts. • Recreational anchoring and mooring mitigation.	• Increase opportunity and motivation to interact with natural/blue environment. • Raise awareness of benefits provided by seas and estuaries. • Increase facilities and access to take part in recreational activities.

These actions alone are not expected to address the full remit of global societal outcomes linked to SDGs. However, many aspects address interlinked SDGs, as required in the aims of a city marine park to enhance health and wellbeing (Pittman et al., 2019) (Table 4). Further indicators will be required, especially to link economic and social welfare indicators to assess benefits from the NMP. Indicators to assess change in social welfare factors will need to be developed in relation to a range of initiatives to achieve wider social benefits. Such as, approaching and assessing change in ocean literacy and barriers to engagement and equality of access and social inclusion with marine social, economic and recreational activities.

The NMP has the potential to provide a win-win, alleviating challenges identified in the TEMP and addressing societal outcomes linked to SDGs. The role of the NMP is likely to be key in relation to aims to develop new and innovative ways to engage people with the marine and maritime environment. Initiatives are required to enable wider awareness raising and ensure interaction with the marine environment is enhanced, but with environmentally responsible behaviours undertaken by all actors, general public, industry and governance. Engagement and awareness raising is key to addressing existing and future TEMP challenges and mitigation actions. From awareness raising of positive implications of environmentally responsible anchoring and mooring, small craft use and swimming, to ensuring agriculture, sewerage infrastructure practices and housing developments reduce negative impacts on the estuarine and marine water bodies and governance is in place to encourage this.

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SUPPLEMENTARY MATERIAL 1:

Justification for risk register scoring (assessed impact of TEMP actions)

We set out here assessment relating to the 173 asset benefit relationships identified in the first stage of the analysis as being most influential, where there is a link between the extent, condition or spatial configuration of the habitat or species assets and the flow of benefits. In total there were 233 low – significant contributions to the 5 key ES benefits considered, of these, 173 components were assessed to have a moderate or high contribution to the 5 key ES benefits. The Extent, Condition or Spatial Configuration status and trend of the habitat or species assets are assessed in relation to a defined target. These are the relationships that received a Red, Amber or Green rating according to their risk rating. The Table below explains how the following Tables can be read, adapted from Mace et al., (2015).

The R (Red), Amber (A), Green (G) score is shown in the RAG key table (below). Evidence for each assessment is shown in the Table and an Uncertainty score for each Status and Trend measurement is estimated (1 to 4). These individual scores are added in the final column to give an overall uncertainty for the RAG rating (Low uncertainty <=4; high uncertainty >=5).

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend	RAG (A-C)
		• **Bold text = med to significant contribution.** • Light text = low contribution	Characteristic of the asset being assessed: Extent, Condition or Spatial Configuration. Condition sets out production functions, within underlying natural capital assets. Where available indicators were assessed that can be influenced and are important to provision of ES benefits.	What is the status of the relationship relative to a defined target? RAG rating for trend Uncertainty of Trend		What is the trend in the relationship? RAG rating for Status Uncertainty of Status	RAG (Overall RAG based on status and trend) Total Uncertainty (Summation of Uncertainty)

		Status		
		Above, at or just below target	Below target	Substantially below target
Trend in Status	Positive or not discernible	*A*	*B*	*B*
	Negative	*B*	*B**	*C*
	Strongly negative	*C*	*C*	*C*

		Status		
		Above, at or just below target	Below target	Substantially below target
Trend in Status	Positive or not discernible	*Low*	*Medium*	*Medium*
	Negative	*Medium*	*Medium**	*High*
	Strongly negative	*High*	*High*	*High*

		Agreement	
		High	Low
Robustness	*Significant evidence*	**1**	**3**
	Limited evidence	**2**	**4**

	High confidence	Low confidence
Low risk	*A*	*A*
High risk (or risk unknown)	*B-B**	*B – B**
Very high risk	*C*	*C*

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
Coastal Margin	Saltmarsh	• **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).** • **Sea defence. (natural hazard regulation).** • **Tourism/nature watching.** • **Clean water and sediments.**	Quantity/Extent	Saltmarsh extent in Plymouth Sound and Estuaries SAC up to the high water mark is 0.29km², area within an MPA is 0.29km² and area intersecting a management measure (for benthic activity) is 0.29km². Saltmarsh habitats support nursery areas for multiple commercially targeted fish species and provide a significant level of contribution to all key ES. Saltmarsh extent had not been monitored since 2012 and Natural England condition assessments state it is being reviewed, extent including that beyond the high water mark was recorded as 1.97km² (Natural England, 2021). The extent is assessed in favourable condition. Between 2008-2012 no change in extent was recorded in Plymouth Tamar waterbody, a decrease of 0.026 km² was recorded in Yealm. Comparison to OS map extents in 1860 suggest a decline (-0.3km²) despite a 0.03km² increase through land claim across the site (Environment Agency, 2021). Ongoing actions include updating monitoring and 0.11km² increase in extent saline reed bed in relation to habitat creation and managed realignment projects (Environment Agency, 2021).	Extent to be stable or increasing and ≥95% SSSI favourable / recovering (GES). This target is also recognised as needing to be reached by 2020 in Biodiversity Strategy 2020. MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain').	Saltmarsh extent has decreased by a small extent between 2008-2012 in Yealm (0.03km²). Confidence is limited as monitoring has only been undertaken between 2008 and 2012/13 (Natural England, 2021). In long term since 1860 a decline of -0.3km² is estimated. Non discernible change (positive through habitat creation but limited confidence in change in extent of natural marsh and reed bed)	**+ Creation of habitat.**	**A (8)**
				A (low confidence/unknown) - last assessment 2012		A		
				(4)		(4)		
	Saltmarsh	• **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).**	Quality/Condition	Saltmarsh assessed in favourable condition. Saltmarsh in the Tamar Estuary is not particularly species diverse when compared with some other estuaries. (Condition currently relies on outdated evidence). Ongoing actions include updating monitoring and potential increase in extent in relation to habitat restoration and managed	≥95% SSSI favourable/recovering (GES). This target is also recognised as needing to be reached by 2020 in Biodiversity Strategy 2020.	Natural England (2021) identify a high degree of consistency in species composition across all	**No change (monitoring required to have confidence in assessment)**	**A (8)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
		• **Sea defence. (natural hazard regulation).** • **Tourism/nature watching.** • **Clean water and sediments.**		realignment projects, condition evidence will be updated under planned monitoring (Natural England, 2021)	MSFD, GES: Condition **(Inside MPAs):** >95% of extent in MPAs in favourable condition (maintain)	surveyed units when comparing 2013 to the previous condition monitoring survey in 2009/2010.		
				A – last assessment >6 years ago		A		
				(4)		(4)		
	Saltmarsh	• **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).** • **Sea defence. (natural hazard regulation).** • **Tourism/nature watching.** • **Clean water and sediments.**	Spatial configuration	Assessment of spatial biological communities and habitat use by juvenile fish species has not been assessed. Species communities assessed as favourable condition. Saltmarsh in the Tamar Estuary was not particularly species diverse when compared with some other estuaries (Natural England 2021). Tamar-Tavy SSSI and Lynher SSSI had highest diversity (21-22 species), St Johns Lake SSSI had lower diversity (14 species) (Natural England, 2021).	Extent and distribution of saltmarsh to be stable or increasing.	Unknown	**No change (monitoring required to have confidence in assessment)**	**A (8)**
				A		A		
				(4)		(4)		
	Littoral rock	• **Food (Wild Food - fish and shellfish).** • **Sea defence. (natural hazard regulation).** • **Healthy Climate.** • **Tourism/nature watching.**	Quantity/Extent	Littoral rock (low, moderate and high energy) extent in Plymouth Sound and Estuaries SAC to high tide mark is 1.84km², area within an MPA is 1.53km² and area intersecting a management measure (for benthic activity) is 1.53km². Extent is stable in MPAs. Although extent of underlying littoral rock may not change, native species communities may reduce as Pacific oyster populations spread. Continues monitoring and removal has shown removal for beneficial means is difficult from rock, as the oyster shells have to be broken. There is a risk this may limit maintaining risk at 'low' long term.	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain'). **Extent: (outside MPAs)** area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Limited evidence but assumed to have not changed as condition has remained favourable. Non discernible. (Requires continued monitoring of Pacific oyster populations to	**No change**	**A (6)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
						record impact on extent of native littoral rock communities.		
				A		A		
				(2)		(4)		
	Littoral rock	• **Food (Wild Food - fish and shellfish).** • **Sea defence. (natural hazard regulation).** • Healthy Climate. • Tourism/nature watching.	Quality/Condition	Littoral rock features in designated MPAs are, overall, assessed to be in 'favourable' condition, apart from in Yealm estuary where the feature and native species community is adversely impacted by invasive non-native species. There is limited information on condition of littoral rock habitats outside designated MPAs, and impact of INNS outside the Yealm. Littoral rock communities are also adversely impacted by high levels of aqueous contaminant levels TBT and its compounds, in the Yealm. Of extent outside the MPAs, 0.15km² (50%) is in LRC of 3 or below. Assessed as below target inside and outside MPAs. Continued monitoring of spread of Pacific oyster populations and impact on native communities is required, as well as monitoring of effectiveness of removal activities. Likely to remain 'below target' due to presence of Pacific oyster and continued chemical contaminant pressures.	MSFD, GES: Condition **(Inside MPAs):** >95% of extent in MPAs in favourable condition (maintain) Condition: **(outside MPAs)** Area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Limited evidence of extent impacted but condition decreased related to invasive non-native species, Yealm INNS populations may have impacted ~11% of littoral rock habitats in Yealm and populations are likely to increase at other sites within the EMS.	**+/-** **Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain and limit available habitat for native species community.**	**B* (6)**
				B		B		
				(2)		(4)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Littoral rock	• **Food (Wild Food - fish and shellfish).** • **Sea defence. (natural hazard regulation).** • Healthy Climate. • Tourism/nature watching.	Spatial configuration	Extent of habitat feature unlikely to have changed. Changes in spatial distribution of communities are unknown, but there is evidence of loss of native communities related to increased extent of Pacific oyster communities on littoral rock substratum especially in Yealm. Low energy intertidal rock is typically dominated by native fucoid communities, moderate energy by barnacles and fucoid communities and high energy by barnacles, periwinkle and mussel communities (Natural England, 2021).	MSFD, GES: extent is stable or increasing.	Extent and spatial distribution of native species communities are likely to be adversely impacted by invasive non-native Pacific oyster populations, particularly in the Yealm estuary.	**+/- see 'condition' characteristic**	**B* (6)**
				B		B		
				(2)		(4)		
	Littoral coarse sediment	• **Sea defence. (natural hazard regulation).** • **Tourism/nature watching.** • **Food (Wild Food - fish and shellfish).**	Quantity/Extent	Littoral coarse sediment extent in Plymouth MPAs is 0.16km², area within an MPA is 0.16km² and area intersecting a management measure (for benthic activity) is 0.16km². Extent assessed as stable apart from Yealm, where spread of Pacific oyster populations may reduce extent of coarse sediment communities.	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain') **Extent: (outside MPAs)** area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Limited evidence but small extents, particularly in Yealm estuary are recorded to interact with spread of Pacific oyster populations. Thereby assessed as negative trend.	**+/- +/-** **Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain.**	**B (6)**
				A		B		
				(2)		(4)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Littoral coarse sediment	**• Sea defence. (natural hazard regulation). • Tourism/nature watching. • Food (Wild Food - fish and shellfish).**	Quality/Condition	Littoral coarse sediment features in designated MPAs are assessed to be in 'favourable' condition. but as 'restore' in relation to Yealm, where spread of Pacific oyster populations may reduce condition of coarse sediment communities. Outside MPAs no area is in LRC of 3 or below.	MSFD, GES: Condition **(Inside MPAs):** >95% of extent in MPAs in favourable condition (maintain)Condition: **(outside MPAs)** Area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Limited evidence but small extents, particularly in Yealm estuary are recorded to interact with spread of Pacific oyster populations.	**+/- Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain**	**B (6)**
				A		B		
				(2)		(4)		
	Littoral coarse sediment	**• Sea defence. (natural hazard regulation). • Tourism/nature watching. • Food (Wild Food - fish and shellfish).**	Spatial configuration	Littoral coarse sediment features in designated MPAs are assessed to be in 'favourable' condition. but as 'restore' in relation to Yealm, where spread of Pacific oyster populations may reduce condition of coarse sediment communities.	Current extent and condition in MPAs: stable or increasing (80% of all PSEC extent is contained in MPAs)	Limited evidence across entire site but increasing Pacific oyster populations have led to a negative trend.	**+/- Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain**	**B (6)**
				A		B		
				(2)		(4)		
	Littoral sand and muddy sand	**• Sea defence. (natural hazard regulation). • Tourism/nature watching.** • Heathy Climate	Quantity/Extent	Extent in MPAs is assessed as 'restore'. Littoral sand and muddy sand extent in Plymouth Sound and Estuaries SAC is 4.06km², area within an MPA is 4.00km² and area intersecting a management measure (for benthic activity) is 4.00km². Invasive non-native Pacific oysters have altered the composition of component communities, thus reducing extent of native communities, especially where reefs of Pacific oysters have formed in the Yealm estuary. Whilst	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain') **Extent: (outside MPAs)** area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable	Limited evidence across entire site but increasing Pacific oyster populations have led to a negative trend in extent and	**+/- Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations**	**B * (6)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				NE identify this affects only a small proportion of the feature at present, the affected area may increase in the future. Curtis (2018) identify 11% of littoral sand and muddy sand as well as littoral mud habitat are noticeably impacted by Pacific oyster populations. Assessed as 'below target'.	impact (LRC below 3) ≤ 10% for entire PSEC.	condition of native habitats.	**likely to remain**	
				B		B		
				(2)		(4)		
	Littoral sand and muddy sand	**• Sea defence. (natural hazard regulation).** **• Tourism/nature watching.** • Heathy Climate	Quality/Condition	Littoral sand and muddy sand features in designated MPAs are assessed to be in 'restore' condition. Invasive non-native Pacific oysters have altered the composition of component communities, thus reducing extent of native communities, especially where reefs of Pacific oysters have formed in the Yealm estuary and populations extend over large extents of littoral sand and muddy sand in St Johns Lake. Whilst NE identify this affects only a small proportion of the feature at present, the affected area may increase in the future. 0.01km² outside MPAs was assessed in LRC of 3 or below (17% of extent outside MPAs, 0.24% of entire extent).Habitat assessed as below target.	MSFD, GES: Condition **(Inside MPAs):** >95% of extent in MPAs in favourable condition (maintain) Condition: **(outside MPAs)** Area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Limited evidence but assumed to have not changed as condition has remained favourable. Increasing Pacific oyster populations have led to a negative trend in extent and condition of native habitats.	**+/-** **Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain**	**B* (6)**
				B		B		
				(2)		(4)		
	Littoral sand and muddy sand	**• Sea defence. (natural hazard regulation).** **• Tourism/nature watching.** • Heathy Climate	Spatial configuration	Extent in Yealm and potentially other areas in MPAs assessed as 'restore'. Main pressure on spatial configuration of native species communities is due to expansion of Pacific oyster populations, particularly in the Yealm and St Johns Lake.	Current extent and condition in MPAs: favourable (stable or increasing) (97% of all PSEC extent is contained in MPAs)	Limited evidence but assumed to have not changed as condition has remained favourable.	**+/-** **Small positive impact. See condition.**	**B * (6)**
				A		B		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				(2)		(4)		
	Littoral mud	• **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).** • **Clean water and sediments.** • Sea Defence • Tourism/nature watching	Quantity/Extent	Extent in MPAs stable or increasing. Extent of littoral mud in the site is 12.93km², extent within an MPA is 9.89km² and area intersecting a management measure (for benthic activity) is 9.89km².	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain'. **Extent: (outside MPAs)** area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Limited evidence but decreasing trend as Pacific oyster populations have expanded. Feature in MPAs 'restore / unfavourable' due to Pacific oyster density and high TBT levels in Yealm.	**+/-** **Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain.**	**B* (6)**
				B		B		
				(2)		(4)		
	Littoral mud	• **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).** • **Clean water and sediments.** • Sea Defence • Tourism/nature watching	Quality/Condition	Littoral mud features in designated MPAs are assessed to be in 'restore' condition, relating to Invasive non-native Pacific oyster populations, especially in the Yealm, and St Johns Lake and in relation to elevated TBT compounds in the Yealm. Activities/pressures likely to have a greater impact on condition for intertidal habitats include bait digging and crab tiling. Condition in relation to these activities is assessed by IFCA and Natural England to not be excessively impacted, due to limited extent of the activities. 9.5km² of extent inside MPAs were assessed to have an LRC of 3 or below, based on evidence in condition assessments and anchoring and mooring pressure. Outside MPAs 0km² were assessed to have a LRC of 3 or below. Assessed as below target due to degraded condition inside MPAs.	MSFD, GES: Condition **(Inside MPAs):** >95% of extent in MPAs in favourable condition (maintain) Condition: **(outside MPAs)** Area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Limited evidence but decreasing trend as Pacific oyster populations have expanded. Feature in MPAs 'restore / unfavourable' due to Pacific oyster density in and high TBT levels in Yealm.	**+/-** **Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain. TBT impact remains due to persistence of the chemical.**	**B* (6)**
				B		B		
				(2)		(4)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Littoral mud	• **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).** • **Clean water and sediments.** • **Sea Defence.** • **Tourism/nature watching.**	Spatial configuration	Spatial distribution of species communities associated with littoral mud habitats impacted by spread of Pacific oyster populations.	Current extent and condition in MPAs: stable and condition favourable (43% of all PSEC extent is contained in MPAs)	Limited evidence but assumed to have been impacted by spread of Pacific oyster and chemical contamination.	**See 'condition' characteristic**	**B* (8)**
				B		B		
				(4)		(4)		
	Littoral mixed sediments	• **Sea defence. (natural hazard regulation).** • **Food (Wild Food - fish and shellfish).** • Healthy Climate.	Quantity/Extent	Extent of littoral mixed sediments in the site is 0.31km², extent within an MPA is 0.3km² and area intersecting a management measure (for benthic activity) is 0.3km². Current extent in MPAs is likely to be adversely impacted by spread of invasive non-native Pacific oyster populations, especially in the Yealm. Trampling related to recreational activities and crab tiling are also risks to the habitat.	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain') **Extent: (outside MPAs)** area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Limited evidence but assumed to have declined in locations such as the Yealm estuary where Pacific oyster populations have spread.	**+/-** **Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain.**	**B * (6)**
				B		B		
				(2)		(4)		
	Littoral mixed sediments	• **Sea defence. (natural hazard regulation).** • **Food (Wild Food - fish and shellfish).** • Healthy Climate.	Quality/Condition	Littoral mixed sediment features in designated MPAs are assessed to be in 'favourable' condition. There is limited information on condition of littoral mud habitats outside designated MPAs. Inside MPAs area impacted by invasive species and interacting with anchoring and mooring pressures relates to LRC of 3 or below for 0.28km² (93% of extent in MPAs). No extent of littoral mixed sediment are adversely	MSFD, GES: Condition **(Inside MPAs):** >95% of extent in MPAs in favourable condition (maintain) Condition: **(outside MPAs)** Area of habitat lost + area of habitat below GES (in condition recover or	Limited evidence but adversely impacted by spread of Pacific oyster populations.	**+/-** **Small positive impact. Further trials of removal of Pacific oyster may limit spread but**	**B* (6)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				impacted outside MPAs. Due to extent adversely impacted within Yealm area of SAC, assessment is 'below target'.	impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.		**populations likely to remain.**	
				B		B		
				(2)		(4)		
	Littoral mixed sediments	**• Sea defence. (natural hazard regulation).** **• Food (Wild Food - fish and shellfish).** **• Healthy Climate.**	Spatial configuration	Spatial distribution of species communities associated with littoral mixed sediment habitats are unknown.	Current extent and condition in MPAs: stable and condition favourable	Limited evidence but adversely impacted by spread of Pacific oyster populations.	**See 'condition' characteristic**	**B* (8)**
				B		B		
				(4)		(4)		
	Littoral seagrass beds	**• Food (Wild Food - fish and shellfish). • Healthy climate (carbon sequestration).** **• Sea defence. (natural hazard regulation).** **• Tourism/nature watching.** **• Clean water and sediments.**	Quantity/Extent	Littoral seagrass bed extent in the site is 0.4km², area within an MPA is 0.4km² and area intersecting a management measure (for benthic activity) is 0.4km². Seagrass extent had decreased in long term monitoring in all sites but Cawsand in monitoring focusing on sublittoral seagrass. Less data is available on change in littoral seagrass. Assessed as below target as a precautionary approach, due to known invasive species presence and high levels of contaminants, particularly in the Yealm. Anchoring and mooring also impact littoral seagrass.	Extent to be stable or increasing and ≥95% Condition assessment favourable.	Limited data is available on trend in extent for littoral seagrass, likely to have declined due to known invasive species presence and high levels of contaminants, particularly in the Yealm. anchoring and mooring also impact littoral seagrass.	**+ Potential for anchoring and mooring impacts to reduce due to awareness raiding actions within the REMEDIES project. Additional monitoring required due to high ES contribution from habitat.**	**B (*)**
				B		A		
				(4)		(4)		
		• Food (Wild Food - fish and	Quality/condition	Seagrass assessed in favourable condition. Wasting disease identified in monitoring of	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or	Increase in wasting disease	**+ Potential for anchoring and**	

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Littoral seagrass beds	**shellfish). • Healthy climate (carbon sequestration). • Sea defence. (natural hazard regulation). • Tourism/nature watching. • Clean water and sediments.**		subtidal sites. Little evidence on littoral seagrass. Invasive seaweed *Sargassum muticum* is known to be common in the inshore periphery of the seagrass beds in Cellars Cove at the mouth of the Yealm. Condition assessment indicates 0.4km² of littoral seagrass having an LRC of 3 or below (as a precautionary measure: assessed as below target).	increasing (>95% conservation objective 'maintain') **Extent: (outside MPAs)** area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	identified in annual monitoring sites. (as a precautionary measure: assessed as below target). Compared to other UK sites, seagrass habitat is in top 10 impacted by anchoring and mooring and recreational pressures.	**mooring impacts to reduce due to awareness raiding actions within the REMEDIES project. Additional monitoring required due to high ES contribution from habitat.**	**B (8)**
				B		A		
				(4)		(4)		
	Littoral seagrass beds	**• Food (Wild Food - fish and shellfish). • Healthy climate (carbon sequestration). • Sea defence. (natural hazard regulation). • Tourism/nature watching. • Clean water and sediments.**	Spatial configuration	Assessment of spatial biological communities and habitat use by juvenile fish species has not been assessed. Species communities assessed as favourable condition. Although decrease in extent and wasting disease presence has been detected in annual monitoring.	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain') **Extent: (outside MPAs)** area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Increase in wasting disease identified in annual monitoring sites. Compared to other UK sites, seagrass habitat is in top 10 impacted by anchoring and mooring and recreational pressures.	**See 'condition' characteristic**	**B (8)**
				B		A		
				(4)		(4)		
	Littoral biogenic reefs	**• Sea defence. (natural hazard regulation).**	Quantity/Extent	Extent of littoral biogenic reef in the site is 0.2km², extent within an MPA is 0.1km² and area intersecting a management measure (for benthic	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95%	Extent is likely to be adversely impacted if	**+/- Small positive impact.**	**B* (6)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
		• **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).** • **Clean water and sediments.** •**Tourism/ nature watching**.		activity) is 0.1km². Recent monitoring of extent of mussel beds by Curtis et al., (2018) identified that the blue mussel beds in the Tamar-Tavy, St Johns Lake and the Lynher Estuary sites, have not changed significantly in extent or distribution since 2010. Gathering of shellfish is prohibited due to high bacterial contamination levels present in Tamar estuary above Henn Point and Plym estuaries (Cefas, 2020). This limits flow of food benefits to 'below target'.	conservation objective 'maintain') **Extent: (outside MPAs)** For 95% extent in PSEC assessed to be un-impacted by anthropogenic activities (in LRC >3).	spread of Pacific oyster continues in the site.	**Further trials of removal of Pacific oyster may limit spread but populations likely to remain.**	
				B		B		
				(2)		(4)		
	Littoral biogenic reefs	• **Sea defence. (natural hazard regulation).** • **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).** • **Clean water and sediments.** •Tourism/ nature watching.	Quality/Condition	Mussel beds at Jupiter Point and Shillingham Point (Lynher estuary) were assessed to be of poor quality from a fishery point of view, with a high percentage of shell and live mussel which appears to be dominated by a single year class (Jenkin et al., 2016).Two non-native species, Pacific oyster *Magallana gigas* and slipper limpet *Crepidula fornicat*a, were found during surveys (Jenkin et al., 2016), suggesting limited confidence in current assessment of 'favourable' condition of blue mussel beds.	MSFD, GES: **Condition: (Inside MPAs):** favourable/maintain (>95% conservation objective 'maintain') **Condition: (outside MPAs)** For 95% extent in PSEC assessed to be un-impacted by anthropogenic activities/pressure habitat is sensitive to (in LRC >3).	Condition is likely to be adversely impacted if spread of non-native species continues in the site.	**+/-** **Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain.**	**B* (6)**
				B		B		
				(2)		(4)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Littoral biogenic reefs	**• Sea defence. (natural hazard regulation).** **• Food (Wild Food - fish and shellfish).** **• Healthy climate (carbon sequestration).** **• Clean water and sediments.** **•Tourism/ nature watching.**	Spatial configuration	Mussel beds at Jupiter Point and Shillingham Point (Lynher estuary) were assessed to be of poor quality from a fishery point of view, with a high percentage of shell and live mussel which appears to be dominated by a single year class (Jenkin et al., 2016).Two non-native species, Pacific oyster *Magallana gigas* and slipper limpet *Crepidula fornicat*a, were found during surveys (Jenkin et al., 2016), suggesting limited confidence in current assessment of 'favourable' condition of blue mussel beds.	Current extent and condition in MPAs: stable and condition favourable (100% of all PSEC extent is contained in MPAs)	Spatial configuration of native mussel communities is likely to be adversely impacted if spread of non-native species continues in the site.	**+/-** **Small positive impact. Further trials of removal of Pacific oyster may limit spread but populations likely to remain.**	**B* (8)**
				B		B		
				(4)		(4)		
	Infralittoral rock	**• Food (Wild Food - fish and shellfish).** **• Healthy climate (carbon sequestration).** **• Sea defence. (natural hazard regulation).** **• Tourism/nature watching.**	Quantity/Extent	Extent of infralittoral rock in the site is 9.24km², extent within an MPA is 8.97km² and area intersecting a management measure (for benthic activity) is 8.97km². Extent in MPAs is assessed as stable or increasing. Assessed as 'maintain in latest conservation advice. Outside MPAs, 0.12km² is assessed in LRC at or below 3 (1.3% of total extent and 40% of the extent outside MPAs). Assessed as just below target for whole site.	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain') **Extent: (outside MPAs)** For 95% extent in PSEC assessed to be un-impacted by anthropogenic activities (in LRC >3).	Limited evidence but assumed to have not changed as condition has remained favourable. Assessed as not discernible	**+ Continued benefit due to IFCA byelaws limiting abrasion pressure. Litter from angling likely to remain a pressure.**	**A (6)**
				B		B		
				(2)		(4)		
	Infralittoral rock	**• Food (Wild Food - fish and shellfish).** **• Healthy climate (carbon sequestration).** **• Sea defence. (natural hazard**	Quality/Condition	Infralittoral reef features in designated MPAs are assessed to be in 'favourable' condition. There is limited detailed information on condition of infralittoral reef. Assessed as 'maintain in latest conservation advice. Outside MPAs, 0.12km² is assessed in LRC at or below 3 (1.3% of total extent and 40% of the extent outside MPAs). Assessed as just below target for whole site.	MSFD, GES: **Condition: (Inside MPAs):** favourable/maintain (>95% conservation objective 'maintain'). **Condition: (outside MPAs)** For 95% extent in PSEC assessed to be un-impacted by	Limited evidence but assumed to have not changed as condition has remained favourable.	**+ Continued benefit due to IFCA byelaws limiting abrasion pressure. Litter from angling likely**	**A (6)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
		regulation). **•** **Tourism/nature watching.**			anthropogenic activities/pressure habitat is sensitive to (in LRC >3).	However there is concern for 40% of the small proportion of total extent outside MPAs. Assessed as not discernible.	**to remain a pressure.**	
				A		A		
				(2)		(4)		
	Infralittoral rock	**• Food (Wild Food - fish and shellfish).** **• Healthy climate (carbon sequestration).** **• Sea defence. (natural hazard regulation).** **•** **Tourism/nature watching.**	Spatial configuration	Extent stable. Assessed as 'maintain' in latest conservation advice. Outside MPAs, 0.12km² is assessed in LRC at or below 3 (1.3% of total extent and 40% of the extent outside MPAs). Assessed as just below target for whole site.	Current extent and condition in MPAs: stable and condition favourable (72% of all PSEC extent is contained in MPAs)	Limited evidence but assumed to have not changed as condition has remained favourable. However there is concern for 40% of the small proportion of total extent outside MPAs. Spatial configuration of species communities may be impacted outside MPAs. Assessed as not discernible.	**+ Continued benefit due to IFCA byelaws limiting abrasion pressure. Litter from angling likely to remain a pressure.**	**A (6)**
				A		A		
				(2)		(4)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Circalittoral rock	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.** • Sea Defence.	Quantity/Extent	Extent of circalittoral rock in the site is 15.32km², extent within an MPA is 15.17km² and area intersecting a management measure (for benthic activity) is 15.17km². 100% of circalittoral rock habitats within MPAs is in favourable condition. Outside MPAs 0.08km² are assessed in LRC of 3 or below, 0.5% of total circalittoral reef extent and 53% of extent outside MPAs. Due to small proportion of overall extent adversely impacted by pressures related to human activity, quantity and quality (extent and condition) assessed as just below target.	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain'). **Extent: (outside MPAs)** For 95% extent in PSEC assessed to be un-impacted by anthropogenic activities (in LRC >3).	Limited evidence but assumed to be positive in MPAs as pressures from bottom towed fishing activity reduced since IFCA and MMO byelaws. Potential for changes in extent due to reef/sand veneer masking reef extents in previous surveys.	**+ Continued benefit due to IFCA byelaws limiting abrasion pressure. Abrasion from static gear a continued pressure. Litter from angling likely to remain a pressure.**	**A (6)**
				A		A		
				(2)		(4)		
	Circalittoral rock	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.** • Sea Defence.	Quality/Condition	100% of circalittoral reef within MPAs is in favourable condition. Outside MPAs 0.08km² are assessed in LRC of 3 or below, 0.5% of total circalittoral reef extent and 53% of extent outside MPAs. Due to small proportion of overall extent adversely impacted by pressures related to human activity quantity and quality (extent and condition) assessed as just below target). Historical fishing activity may have impacted Eddystone reefs and these features high risk in relation to revised MPA approach but recovery likely due to IFCA and MMO byelaws. Assessed as just below target.	MSFD, GES: **Condition: (Inside MPAs):** favourable/maintain (>95% conservation objective 'maintain') **Condition: (outside MPAs)** For 95% extent in PSEC assessed to be un-impacted by anthropogenic activities/pressure habitat is sensitive to (in LRC >3).	Expected to be positive due to implementation of byelaws reducing bottom towed fishing activity pressure.	**+ Continued benefit due to IFCA byelaws limiting abrasion pressure. Abrasion from static gear a continued pressure. Litter from angling likely to remain a pressure.**	**A (6)**
				A		A		
				(2)		(4)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Circalittoral rock	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.** • Sea Defence.	Spatial configuration	100% of circalittoral reef within MPAs is in favourable condition. Outside MPAs 0.08km² are assessed in LRC of 3 or below, 0.5% of total circalittoral reef extent and 53% of extent outside MPAs. Due to small proportion of overall extent adversely impacted by pressures related to human activity quantity and quality (extent and condition) assessed as just below target). Historical fishing activity may have impacted species communities on Eddystone reefs and these features high risk in relation to revised MPA approach but recovery likely due to IFCA and MMO byelaws. Assessed as just below target.	Current extent and condition in MPAs: stable and condition favourable (21% of all PSEC extent is contained in MPAs).	Expected to be positive due to implementation of byelaws reducing bottom towed fishing activity pressure.	**+ Continued benefit due to IFCA byelaws limiting abrasion pressure. Abrasion from static gear a continued pressure. Litter from angling likely to remain a pressure.**	**A (4)**
				A		A		
				(2)		(2)		
	Sublittoral coarse sediment	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Quantity/Extent	Sublittoral coarse sediment extent in the site is 84.54km², area within an MPA is 22.23km² and area intersecting a management measure (for benthic activity) is 22.23km². The extent within an MPA has a conservation objective of maintain, although appears within the wider feature 'shallow inlets and bays' which a recent HRA identified risk from invasive non-native, slipper limpet *Crepidula fornicata.* 5.7km² (25.6%) of the proportion inside MPAs were assessed to interact with pressures related to invasive species, elevated contaminant levels or physical pressure from anchoring and mooring with an LRC of 3 or below. Outside MPAs 59km² have an LRC below level 3, 70% to total extent. Assessed as below target.	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain') **Extent: (outside MPAs)** area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Unknown as a precautionary measure, until trend is known the trend is assessed as negative (with low confidence).	**+/- No change as 70% of total extent may remain impacted by mobile demersal fishing gear and anchoring and mooring pressures.**	**B* (4)**
				B		B		
				(2)		(2)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Sublittoral coarse sediment	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Quality/Condition	The extent within an MPA has a conservation objective of maintain, although appears within the wider feature 'shallow inlets and bays' which a recent HRA (Curry et al., 2014) identified risk from invasive non-native, slipper limpet Crepidula fornicata. 5.7km² (25.6%) of the proportion inside MPAs were assessed to interact with pressures related to anchoring and mooring with an LRC of 3 or below. Outside MPAs 59km² have an LRC of level 3 or below, 70% of total extent. Assessed as substantially below target, with limited confidence in LRC assessment of impact of bottom towed fishing on condition outside MPAs.	MSFD, GES: Condition **(Inside MPAs):** >95% of extent in MPAs in favourable condition (maintain)Condition: **(outside MPAs)** Area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC 3 or below) ≤ 10% for entire PSEC.	Unknown as a precautionary measure, until trend is known the trend is assessed as negative (with low confidence).	**+/- No change as 70% of total extent may remain impacted by mobile demersal fishing gear and anchoring and mooring pressures.**	**C (6)**
				C		B		
				(4)		(2)		
	Sublittoral coarse sediment	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Spatial configuration	Currently there is no site-specific evidence on the presence and spatial distribution of the biological communities (Natural England, 2018). In relation to LRC assessment spatial configuration of communities are likely to be adversely impacted and assessed as 'substantially below target'.	Current extent and condition in MPAs: stable and condition favourable (% of all PSEC extent is contained in MPAs)	Unknown as a precautionary measure, until trend is known the trend is assessed as negative (with low confidence).	**+/- No change as 70% of total extent may remain impacted by mobile demersal fishing gear and anchoring and mooring pressures.**	**C (6)**
				C		B		
				(4)		(2)		
	Sublittoral sand	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Quantity/Extent	Sublittoral sand extent in the site is 46km², area within an MPA is 5.3km² and area intersecting a management measure (for benthic activity) is 5.3km². Wider features are assessed as maintain but spread of non-native Crepidula fornicata and elevated sediment contaminant levels are identified in the site to adversely affect the habitat. Currently extent in LRC of 3 or below in MPA, interacting with anchoring and mooring	Marine Strategy Framework Directive (2008) - achieve Good Environmental Status(GES) in all UK marine waters by 2020. Current extent in MPAs: stable or increasing (2 MPAs were only recently designated (2016).	Limited evidence of substratum habitat and community distribution to confidently assess trend.	**+/- No change Extent in MPAs continues to be impacted by invasive non-native species and elevated**	**B* (4)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				pressures, invasive species pressure, or elevated contamination levels is 0.2km² (3.8% of extent in an MPA), extent outside MPAs in LRC of 3 or below, primarily linked to bottom towed fishing activity is 39.4km² (85.6% of entire extent, 92% of extent outside MPAs). Assessed as below target.			**contamination levels. Extent inside MPAs impacted by anchoring and mooring, Extent outside by mobile demersal fishing activity.**	
				B		B		
				(2)		(2)		
	Sublittoral sand	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Quality/Condition	Wider features are assessed as maintain but spread of non-native *Crepidula fornicata* and elevated sediment contaminant levels are identified in the site to adversely affect the habitat. Currently extent in LRC of 3 or below in MPA, interacting with anchoring and mooring pressures, invasive species pressure, or elevated contamination levels is 0.2km² (3.8% of extent in an MPA), extent outside MPAs in LRC of 3 or below, primarily linked to bottom towed fishing activity is 39.4km² (85.6% of entire extent, 92% of extent outside MPAs). Assessed as below target. Due to high extent in LRC of 3 or below, condition is assessed as substantially below target.	Good Environmental Status (GES) in all UK marine waters by 2020. Current extent and condition in PSEC MPAs: >95% of extent in MPAs to be in favourable condition, <10% of extent in PSEC impacted by anthropogenic activities.	Limited evidence of substratum habitat and community distribution to assess trend. Assessed as negative in MPAs (but some Limited evidence of substratum habitat and community distribution to assess trend	**+/- No change Condition in MPAs continues to be impacted by invasive non-native species and elevated contamination levels. Condition inside MPAs impacted by anchoring and mooring, Condition outside by mobile demersal fishing activity.**	**C (6)**
				C		B		
				(4)		(2)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Sublittoral sand	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Spatial configuration	Currently there is no site-specific evidence on the presence and spatial distribution of the biological communities (Natural England, 2018). As a precautionary measure this is just assessed as substantially below below target as native infauna are likely impacted by spread of non-native Crepidula fornicata and elevated sediment contaminant levels are identified in the site to adversely affect the habitat. Currently extent in LRC of 3 or below in MPA, interacting with anchoring and mooring pressures, invasive species pressure, or elevated contamination levels is 0.2km² (3.8% of extent in an MPA), extent outside MPAs in LRC of 3 or below, primarily linked to bottom towed fishing activity is 39.4km² (85.6% of entire extent, 92% of extent outside MPAs).		Limited evidence of substratum habitat and community distribution to assess trend	**See 'condition' characteristic**	**C (6)**
				C		B		
				(4)		(2)		
	Sublittoral mud	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Quantity/Extent	Sublittoral mud extent in the site is 14.2km², area within an MPA is 13.45km² and area intersecting a management measure (for benthic activity) is 10.31km². Wider features are assessed as maintain but spread of non-native *Crepidula fornicata* and elevated sediment contaminant levels are identified in the site to adversely affect the habitat. Currently extent in LRC of 3 or below in MPA, interacting with anchoring and mooring pressures, invasive species, or elevated contaminant levels is 10.32km² (78% of extent in an MPA), extent outside MPAs in LRC of 3 or below in is <0.001km². Assessed as below target due to interaction with pressures from invasive non-native species, elevated contaminant levels and physical pressures related to anchoring and mooring within the MPAs.	Marine Strategy Framework Directive (2008) - achieve Good Environmental Status (GES) in all UK marine waters by 2020. <10% of extent in PSEC impacted by anthropogenic activities.	Limited evidence of substratum habitat and community distribution to assess trend	**+/- No change Extent in MPAs continues to be impacted by invasive non-native species and elevated contamination levels. Extent inside MPAs impacted by anchoring and mooring.**	**B* (4)**
				B		B		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				(2)		(2)		
	Sublittoral mud	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Quality/Condition	Wider features are assessed as maintain but spread of non-native *Crepidula fornicata* and elevated sediment contaminant levels are identified in the site to adversely affect the habitat. Currently extent in LRC of 3 or below in MPA, interacting with anchoring and mooring pressures, invasive species, or elevated contaminant levels is 10.32km² (78% of extent in an MPA), extent outside MPAs in LRC of 3 or below in is <0.001km². Assessed as below target due to interaction with pressures from invasive non-native species, elevated contaminant levels and physical pressures related to anchoring and mooring within the MPAs.	Good Environmental Status (GES) in all UK marine waters by 2020. Current quality in PSEC: Although not a named designated feature, habitat maps show 0.21km² of subtidal mud intersects with MPAs: Condition unknown.	Limited evidence of substratum habitat and community distribution to assess trend. Assessed as negative in MPAs (but some contaminant pressures have been present for long periods). Trend outside MPAs not discernible.	**+/- No change, condition likely to continue to be impacted by invasive species, elevated contaminant levels inside MPAs and anchoring and mooring pressure.**	**C (6)**
				C		B		
				(4)		(2)		
	Sublittoral mud	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Spatial configuration	Currently there is no site-specific evidence on the presence and spatial distribution of the biological communities (Natural England, 2018). As a precautionary measure this is assessed as below target due to adversely impacted condition.		Limited evidence of substratum habitat and community distribution to assess trend	**+/- No change, see 'condition' characteristic.**	**C (6)**
				C		B		
				(4)		(2)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Sublittoral mixed sediments	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Quantity/Extent	Sublittoral mixed sediment extent in the site is 83.8km², area within an MPA is 12.9km² and area intersecting a management measure (for benthic activity) is 12.9km². Condition of wider feature is maintain but feature fails condition assessment targets on secondary attributes due to spread of invasive non-native slipper limpet populations and elevated contaminant levels. Habitat within MPAs has an LRC of level 3 or below for 12.8km² (99.2% of extent within MPAs). Outside MPAs, of the 70.9km² of sublittoral mixed sediments, 70.7km² are assessed in LRC of 3 or below in relation to pressures related to bottom towed fishing activities.	Marine Strategy Framework Directive (2008) - achieve Good Environmental Status(GES) in all UK marine waters by 2020. >10% of extent in PSEC un-impacted by anthropogenic activities.	Limited evidence of substratum habitat and community distribution to assess trend. Due to spread of invasive non-native species populations, expected to be negative.	**+/- No change Extent in MPAs continues to be impacted by invasive non-native species and elevated contamination levels. Extent inside MPAs impacted by anchoring and mooring, Extent outside by mobile demersal fishing activity.**	**B* (4)**
				B		B		
				(2)		(2)		
	Sublittoral mixed sediments	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Quality/Condition	Condition of wider feature is maintain but feature fails condition assessment targets on secondary attributes due to spread of invasive non-native slipper limpet populations and elevated contaminant levels. Habitat within MPAs has an LRC of level 3 or below for 12.8km² (99.2% of extent within MPAs). Outside MPAs, of the 70.9km² of sublittoral mixed sediments, 70.7km² (99.7%) are assessed in LRC of 3 or below in relation to pressures related to bottom towed fishing activities. Due to impacts with the MPA and the large extents outside the MPAs in LRC of 3 or below, assessed as substantially below target.	Good Environmental Status (GES) in all UK marine waters by 2020. Current quality in PSEC: Although not a named designated feature, habitat maps show 2.04km² of sublittoral mixed sediments intersects with MPAs: Condition unknown. Target of less than 10% of habitat extent in PSEC to be impacted by anthropogenic activities.	Limited evidence of substratum habitat and community distribution to assess trend	**+/- No change, condition likely to continue to be impacted by invasive species, elevated contaminant levels inside MPAs and anchoring and mooring pressure. Outside MPAs likely**	**C (6)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
							impacted by demersal fishing activity.	
				C		B		
				(4)		(2)		
	Sublittoral mixed sediments	• **Food (Wild Food - fish and shellfish).** • **Clean water and sediments.** • Healthy Climate. • Sea Defence.	Spatial configuration	Currently there is no site-specific evidence on the presence and spatial distribution of the biological communities (Natural England, 2021).		Limited evidence of substratum habitat and community distribution to assess trend	**+/- No change, see 'condition' characteristic.**	**C (8)**
				C		B		
				(4)		(4)		
	Sublittoral seagrass	• **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).** • **Sea defence. (natural hazard regulation).** • **Tourism/nature watching.** • **Clean water and sediments.**	Quantity/Extent	Seagrass extent in the site is 0.4km², area within an MPA is 0.4km² and area intersecting a management measure (for benthic activity) is 0.4km². Area impacted by pressures habitat is sensitive to 0.4km². Seagrass habitats support nursery areas for multiple commercially targeted fish species and contributes to multiple ES. Seagrass extent had decreased in long term monitoring. Condition assessment and investigation into recent changes in extent are assessed in NE conservation advice as 'restore' and thereby 'below target'. LRC assessment within MPAs has 100% at or below level 3.	MSFD, GES: **Extent: (Inside MPAs):** extent is stable or increasing (>95% conservation objective 'maintain') **Extent: (outside MPAs)** area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Seagrass extent had decreased in long term monitoring, assessed as declining trend	**+ Positive, if successful, introduction of eco-moorings, habitat re-seeding and awareness raising as a result of REMEDIES project actions likely to aid increase in extent.**	**C (4)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				A		A		
				(2)		(2)		
	Sublittoral seagrass	• **Food (Wild Food - fish and shellfish).** • **Healthy climate (carbon sequestration).** • **Sea defence. (natural hazard regulation).** • **Tourism/nature watching.** • **Clean water and sediments.**	Quality/Condition	Seagrass assessed as 'restore the species composition of communities'. Anchoring and mooring pressure assessed to effect large extents. Wasting disease also identified in monitoring sites (Bunker and Green, 2018). Thereby assessed as below target.	MSFD, GES: Condition (Inside MPAs): >95% of extent in MPAs in favourable condition (maintain) Condition: (outside MPAs) Area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	Impact of mooring abrasion identified in monitoring and wasting disease identified in monitoring sites. Declining trend.	**+ Positive, if successful, introduction of eco-moorings, habitat re-seeding and awareness raising as a result of REMEDIES project actions likely to aid increase in condition of habitat. Reduction of nutrient input as a result of upstream thinking projects also likely to reduce risk of epiphytic algae on seagrass blades.**	**B (4**
				C		C		
				(2)		(2)		
	Sublittoral seagrass	• **Food (Wild Food - fish and shellfish).** •	Spatial configuration	Seagrass assessed as 'restore the species composition of communities'. Anchoring and mooring pressure assessed to effect large	MSFD, GES: Condition (Inside MPAs): >95% of extent in MPAs in	Impact of mooring abrasion	**+ Positive, see condition, REMEDIES**	**A (4)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
		Healthy climate (carbon sequestration). • Sea defence. (natural hazard regulation). • Tourism/nature watching. • Clean water and sediments.		extents. Wasting disease also identified in monitoring sites (Bunker and Green, 2018). Thereby assessed as below target.	favourable condition (maintain) Condition: (outside MPAs) Area of habitat lost + area of habitat below GES (in condition recover or impacted by unacceptable impact (LRC below 3) ≤ 10% for entire PSEC.	identified in monitoring and wasting disease identified in monitoring sites. Declining trend.	**actions and upstream thinking projects likely to aid recovery across seagrass habitat network within the site.**	
				A		A		
				(2)		(2)		
	Water bodies	**• Food (Wild Food - fish and shellfish). • Tourism/nature watching. (• Healthy climate (carbon sequestration). • Sea defence. (natural hazard regulation). • Clean water and sediments).**	Quality/Condition	Water quality (water body status and bathing water quality) is monitored for km² of water bodies that intersect with the site. All water bodies are assessed to fail overall water body status condition. Chemical status fails in 4/4, ecological status fails in 2/4. Trend is negative	Water Framework Directive: Water quality is assessed in relation to ecological, chemical and hydro morphology targets.	Classifications current at time of writing from the waterbody classifications in Environment Agency 2020 catchment data explorer. And have declined in 2/4 water bodies in the site	**+ Positive, see condition, REMEDIES actions and upstream thinking projects likely to aid recovery across seagrass habitat network within the site.**	**B (2)**
				B		B		
				(1)		(1)		
	Water Bodies: Bathing waters	**• Tourism/nature watching. • Food (Wild Food - fish and shellfish).**	Quantity/Extent	Number of designated bating waters with sufficient status or above has not changed. All bathing designated bathing waters in the PSEC area received good or excellent status in the baseline year (2020). A total of 19 pollution alerts occurred in 2020 across all designated bating waters in the site.	Under the Bathing Waters Directive: all designated bathing waters to be classified as 'sufficient' or above: Total number of designated beaches has not changed, however, 4 are	Number of designated bathing waters classified as sufficient or above has not changed.	**+/- No change**	**A (3)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
		• Clean water and sediments.			classified as bathing waters 'poor' (below target) in 2017/18			
				A		B		
				(1)		(2)		
	Water Bodies: Bathing waters	• **Tourism/nature watching.** • **Food (Wild Food - fish and shellfish).** • Clean water and sediments.	Quality/Condition	All bathing designated bathing waters in the PSEC area received good or excellent status in the baseline year (2020). A total of 19 pollution alerts occurred in 2020 across all designated bating waters in the site. Recent publication of CSO monitoring data allowed total duration (hours) and total number of counted spills using 12-24hr counting method to be calculated for the entire year Westcountry Rivers Trust, (2021). This data has been included as it reflects potential year round contamination, beyond the spring and summer bathing season For the entire catchment of the PSEC area, including tributary rivers to estuaries, CSO events totalled 85141.70 hours duration, in relation to 10407 counted spills. For CSO locations adjacent to Plymouth Sound and the lower extent of estuaries within the site, CSO events totalled 19915.68 hours duration, in relation to 4264 counted spills Westcountry Rivers Trust, (2021). The total number of pollution alerts, annually would, thereby, likely exceed the 19 recorded during the 6 month bathing season.	Under the Bathing Waters Directive: all designated bathing waters to be classified as 'sufficient' or above:	Pollution alerts have remained stable however the total number of pollution alerts, annually would, thereby, likely exceed the 19 recorded during the 6 month bathing season.	**+/- No change, further improvement of water treatment and sewer infrastructure required to reduce CSO discharge, although bathing waters in seasons with limited rainfall likely to continue to receive excellent status.**	**B* (3)**
				B		B		
				(1)		(2)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Shellfish waters	• **Tourism/nature watching.** • **Food (Wild Food - fish and shellfish).** • Clean water and sediments.	Quantity/Extent		Shellfish waters are considered 'Shellfish Water Protected Areas' under the Water Framework Directive. Quantity target: Unknown	Unknown	**+/-, no change**	Not assessed
		• **Tourism/nature watching.** • **Food (Wild Food - fish and shellfish).** • Clean water and sediments.	Quality/Condition	Condition of classified shellfish waters reduced due to Bacterial contamination levels which have impacted all designated shellfish waters in the Tamar and Yealm estuaries. Shellfish waters in the site were assessed as 'negative/of concern' in most recent shellfish classifications (Cefas, 2020). Shellfish waters in the Yealm estuary were limited to Class C due to potential for contamination due to high e.coli levels in most recent assessments (Cefas 2020). Class C limitations require Molluscs must contain ≤ 46,000 E. coli per 100 grams of flesh Molluscs and can only go for human consumption after strict purification measures (Cefas, 2020). High contamination levels were present in Tamar estuary above Henn Point and Plym estuaries, leading to bivalve mollusc harvesting and production being prohibited in these areas (Cefas, 2020).	Shellfish waters or 'Shellfish Water Protected Areas' under the Water Framework Directive. Quality target (2013-2018): *reduce pollution in designated shellfish water*. Current target in SW River Basin Management Plan (2015) <300 E.coli/100ml in the shellfish flesh and intravalvular fluid: 0 bivalve harvesting areas of 7 in Taw Torridge, 1 of 1 in Porlock met the target.	Decline	**+/-, no change in status, further improvement of water treatment and sewer infrastructure required to reduce CSO discharge. Potential + change to trend due to Tamar Catchment Partnership and upstream thinking projects.**	**B * (2)**
				C		C		
				(1)		(1)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Fish species (Quota species)	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quantity/Extent	Of 12 Quota species: SSB was below target for 2 species Bass, Whiting. Meeting target for plaice, sole, monkfish. Limited data for majority of species (7 species). Assessed as below target for bass, whiting and 'below target' overall as precaution due to lack of data on other species.	The MSFD requires 'Good Environmental Status' by 2020 (EC, 2008) for fish stocks (Descriptor 3). Three criteria apply to determine if a fish or shellfish stock achieves GES (fishing mortality, reproductive biomass, healthy age and size structure). Spawning Stock Biomass (abundance of reproductive age fish) is required to be above Maximum Sustainable Yield B Trigger. ICES assessments are undertaken over entire ICES areas, and so MSY triggers are calculated over greater spatial scales than a single MPA or NMP site). Confidence limited for species with smaller ranges and in relation to ES benefit delivery linked to Plymouth site habitats.	Positive trends in SSB, TAC were only available for plaice and sole. Landings increase likely to relate to increased effort and not represent increase in stocks. Although may suggest stability.	**Small + positive change likely from seagrass restoration and reed bed creation increasing extent and condition of nursery habitat.**	**B-B* -C (4)**
				B		B		
				(2)		(2)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Fish species (Quota species)	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quality/Condition	Comparison of recommended TAC moving averages (3year) (2012-2014, and 2015-2017) showed an increase for plaice, sole, monkfish. A decrease for bass, whiting, gurnard species, and under MSY for mackerel. No data were available for other species such as skates and rays, turbot and john dory.	Healthy age and size structure is a recognised criteria for assessing GES of fish stocks. Under the Common Fisheries Policy species targets are for fishing to be at or under maximum sustainable yield (recommended TAC is the scientific advice on catch limits to achieve MSY). A decrease in TAC between years suggests a decline in the stock (in relation to the fishing effort it can support).	Comparison of recommended TAC moving averages (3year) (2012-2014, and 2015-2017) showed an increase for plaice, sole, monkfish. A decrease for bass, whiting, gurnard species, and under MSY for mackerel. No data were available for other species such as skates and rays, turbot and john dory.	**small + positive change likely from seagrass restoration and reed bed creation increasing extent and condition of nursery habitat.**	**B-B* (4)**
				B		B		
				(2)		(2)		
	Fish species (Quota species)	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Spatial configuration	Not assessed as stocks move over greater distances than PSEC. Habitat use as nursery areas by juveniles not assessed. Current projects are underway at the time of writing (2018) and assessment of condition of nursery and adult habitat and population structure and habitat association of species will be important to consider in the future.	Abundance, age and size structure (recruitment (yr1), SSB), in relation to PSEC habitats to inform GES.	Not assessed		**Not assessed**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Fish species (Non-Quota species)	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quantity/Extent	As lobster and crab are not limited by quotas, landings per unit effort provides an indicator to assess changes in biomass or abundance. Landings (live weight) of crabs, lobsters and crawfish to Plymouth ports have displayed positive trends between 2010-2019 but this also reflects an increase in 87 under 10m vessels. Effort data were unavailable to confidently assess this indicator. Cefas report stable crab and lobster stocks with limited confidence at site level. Cornwall IFCA report stable or declining LPUE (decline for lobster and crawfish). Landings of lemon sole have displayed a negative trend 2010-2019. LPUE from IFCA provide data with greatest confidence to reflect stocks. A positive trend in landings weight 2010-2019 is evident for all non-quota species aside from lemon sole (significant positive trend for cuttlefish, lobster, and pollack). However effort data is unavailable for research purposes and thereby LPUE cannot be calculated from publically available MMO data, although an increase in effort is likely as under 10 registered vessel numbers in Plymouth ports increased by 87 vessels.	Not assessed. Stable or increasing CPUE.	Cefas report stable crab and lobster stocks with limited confidence at site level. Cornwall IFCA report stable or declining LPUE 2016-2018 (decline for lobster and crawfish, smaller decline for brown crab, stable or small increase for spider crab).	**small + positive change likely from IFCA byelaws reduction of demersal impact and netting pressure, REMEDIES project seagrass restoration and National Trust and Environment Agency reed bed creation increasing extent and condition of nursery habitat.**	**B* (8)**
				B		B		
				(4)		(4)		
	Fish species (Non-Quota species)	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quality/Condition	Crab and lobster stock assessments (published by Cefas), indicate crab (C.pagurus) stocks in the South West UK, are likely to be sustainable and support the current level of harvesting (which is moderate: between minimum reference point and MSY). Harvesting of Lobster (H. gammarus) stocks was assessed to be moderate, but above rates consistent with MSY (although below maximum reference point limit). Effort data were unavailable to confidently assess this indicator. Cefas report stable crab and lobster stocks with limited confidence at site level. Cornwall IFCA report stable or declining LPUE 2016-2018	Fishing mortality at or below MSY	no change in assessment between 2010-2017. Unknown for P.elephas.	**small + positive change likely from IFCA byelaws reduction of demersal impact and netting pressure, REMEDIES project seagrass**	**Lobster B (6) crab A (6)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				(decline for lobster and crawfish, smaller decline for brown crab, stable or small increase for spider crab).			**restoration and National Trust and Environment Agency reed bed creation increasing extent and condition of nursery habitat.**	
				crab +/- (A), Lobster (-) (B)		A-B		
				(2)		(4)		
	Fish species (migratory fish)	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quantity/Extent	CPUE, number caught per license day (commercial net) available for Tamar only up to 2017, number (rod and line recreational catch) to 2019. Net catch 0.2 per license day in 2017. Rod catches on the Tamar returned 52 1SW (grilse) and 50 MSW salmon in 2019. Rod fishing on the Lynher returned 19 1SW (grilse) and 6 MSW salmon in 2019. Validated counts and run estimates of salmon smolts and adults in Tamar have declined from 7'230 in 2010 to 2,763 in 2019 (Cefas, Environment Agency, NRW, 2019; 2020).	Better Sea Trout and Salmon Fisheries – Our Strategy for 2008-2021, "more sea trout and more salmon in more rivers bringing more benefit" (Environment Agency, 2008).	Trends in Atlantic salmon (Salmo salar) % of conservation limit (CL) attained 2010-2019 have shown a decrease, as have validated counts and run estimates of salmon smolts and adults (Cefas, Environment Agency, NRW, 2020)	**+/-, no change species declines across population range, Tamar Catchment Partnership, Environment Agency, Natural England and Rivers Trust projects to reduce migratory barriers and restore spawning habitat, as well as IFCA netting byelaws likely to have longer term + impacts.**	**C (3)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				C		B		
				(2)		(1)		
	Fish species (migratory fish)	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quality/Condition	Fish population supported by river/estuary measured by estimated egg deposition (performance against conservation limit). Data available for Tamar and Lynher. Tamar achieved 77% of conservation limit and Lynher 44% in most recent assessment, a decline from 139 and 266% respectively. All rivers are classified as 'at risk' in relation to meeting management objectives.	Management objectives linked to fish population thresholds (Conservation Limits (CL)). North Atlantic Salmon Conservation Organization target: All salmon populations to be maintained above their conservation limits. 1. For PSEC rivers, each river/estuary to meet CL in 4 out of 5 years. 2. Rivers to be not at risk of meeting management objectives.	Trends in Atlantic salmon (Salmo salar) % of conservation limit (CL) attained 2010-2019 have shown a decrease, as have validated counts and run estimates of salmon smolts and adults (Cefas, Environment Agency, NRW, 2020)	**+/-, no change species declines across population range, Tamar Catchment Partnership, Environment Agency, Natural England and Rivers Trust projects to reduce migratory barriers and restore spawning habitat, as well as IFCA netting byelaws likely to have longer term + impacts.**	**C (2)**
				C		B		
				(1)		(1)		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
	Fish species (migratory fish)	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Spatial configuration	CPUE and egg deposition per river/estuarys in the site have shown declines across populations.	Better Sea Trout and Salmon Fisheries – Our Strategy for 2008-2021, "more sea trout and more salmon in more rivers bringing more benefit" (Environment Agency, 2008).	Trends in Atlantic salmon (Salmo salar) % of conservation limit (CL) attained 2010-2019 have shown a decrease, as have validated counts and run estimates of salmon smolts and adults (Cefas, Environment Agency, NRW, 2020)		**C (2)**
				C		B		
				(1)		(1)		
	Fish of conservation importance - Shad	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quantity/Extent	Conservation advice within Plymouth Sound and estuaries SAC is 'restore' due to the potential impact of Gunnislake Weir on population size. On the Tamar, the number of returning adult Allis shad is unknown but reported counts of fish migrating upstream and egg deposition suggests relatively low population size. There are no other known Allis shad spawning populations in the UK (Maitland & Hatton Ellis, 2003). On the Tamar, the number of returning adult Allis shad is unknown.	Condition assessment under Habitats Directive (Annex II species).	Gunnislake fish trap records suggest that between 2004 and 2011, there were reasonable shad numbers migrating upstream at Gunnislake Weir but these appear to have declined in later years Cotterell and Hillman 2015.		**B* (8)**
				B		B		

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				(4)		(4)		
	Fish of conservation importance - Shad	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quality/Condition	The number of returning adult Allis shad is unknown but reported counts of fish migrating upstream and egg deposition suggests relatively low population size.	Condition assessment under Habitats Directive (Annex II species).	Long term likely to be a decline although on the Tamar, the number of returning adult Allis shad is unknown. Confidence is poor in the assessment.		**B* (8)**
				B		B		
				(4)		(4)		
	Fish of conservation importance - Shad	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Spatial configuration	The number of eggs found per kick sample was relatively low, compared to other European spawning sites, with a maximum recorded catch per unit effort of 2.8 eggs per 30-second kick sample at Gunnislake Weir Pool. Spawning habitat is characterized by an area of coarse substrate limited upstream by a pool and downstream by shallow water with fast-moving currents. The spawning substrate varies from sand (2µ - 2mm) to pebble/cobble (2 - 20cm). Eggs are deposited in water 0.5 to 3.0m deep where the current ranges from 0.5 to 1.5m/s Allis shad spawning sites have been reported from channel widths between 15m and 200m (Aprahamian et al., 2003).	Condition assessment under Habitats Directive (Annex II species).	Unknown		**B* (8)**
				B		B		
				(4)		(4)		
	Fish of conservation importance - European eel	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quantity/Extent	European Eel stocks are recognised to have declined across Europe.	2007 Eel Regulation, Convention of Migratory Species of Wild Animals (CMS)	Decline		**C (8)**

Broad Habitat type	Habitat / Species Asset	Benefit	Characteristic	Current Status	Target	Trend 1. Baseline 2019/20	2. Impact of 2013-2018 TEMP action	Predicted RAG (2022+)
				C		B		
				(4)		(4)		
	Fish of conservation importance - European eel	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Quality/Condition	European Eel stocks are recognised to have declined across Europe	2007 Eel Regulation, Convention of Migratory Species of Wild Animals (CMS)	Decline		**C (8)**
				C		B		
				(4)		(4)		
	Fish of conservation importance - European eel	• **Food (Wild Food - fish and shellfish).** • **Tourism/nature watching.**	Spatial configuration	European eel stocks have been declining in recent years, with the EU adopted Eel Regulation providing a framework for the recovery of eel stock. Council Regulation (EC) No 1100/2007 of 18 September 2007 establishing measures for the recovery of the stock of European eel.	2007 Eel Regulation, Convention of Migratory Species of Wild Animals (CMS)	Not assessed		**Not assessed**
				Decline across range		Decline across range		