

DECISION DOCUMENT NATIONWIDE PERMIT 48

This document discusses the factors considered by the Corps of Engineers (Corps) during the issuance process for this Nationwide Permit (NWP). This document contains: (1) the public interest review required by Corps regulations at 33 CFR 320.4(a)(1) and (2); (2) a discussion of the environmental considerations necessary to comply with the National Environmental Policy Act; and (3) the impact analysis specified in Subparts C through F of the 404(b)(1) Guidelines (40 CFR Part 230). This evaluation of the NWP includes a discussion of compliance with applicable laws, consideration of public comments, an alternatives analysis, and a general assessment of individual and cumulative environmental effects, including the general potential effects on each of the public interest factors specified at 33 CFR 320.4(a).

1.0 Text of the Nationwide Permit

Commercial Shellfish Aquaculture Activities. Discharges of dredged or fill material into waters of the United States or structures or work in navigable waters of the United States necessary for new and continuing commercial shellfish aquaculture operations in authorized project areas. For the purposes of this NWP, the project area is the area in which the operator is authorized to conduct commercial shellfish aquaculture activities, as identified through a lease or permit issued by an appropriate state or local government agency, a treaty, or any easement, lease, deed, contract, or other legally binding agreement that establishes an enforceable property interest for the operator. A “new commercial shellfish aquaculture operation” is an operation in a project area where commercial shellfish aquaculture activities have not been conducted during the past 100 years.

This NWP authorizes the installation of buoys, floats, racks, trays, nets, lines, tubes, containers, and other structures into navigable waters of the United States. This NWP also authorizes discharges of dredged or fill material into waters of the United States necessary for shellfish seeding, rearing, cultivating, transplanting, and harvesting activities. Rafts and other floating structures must be securely anchored and clearly marked.

This NWP does not authorize:

- (a) The cultivation of a nonindigenous species unless that species has been previously cultivated in the waterbody;
- (b) The cultivation of an aquatic nuisance species as defined in the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990;
- (c) Attendant features such as docks, piers, boat ramps, stockpiles, or staging areas, or the deposition of shell material back into waters of the United States as waste; or

(d) Activities that directly affect more than 1/2-acre of submerged aquatic vegetation beds in project areas that have not been used for commercial shellfish aquaculture activities during the past 100 years.

Notification: The permittee must submit a pre-construction notification to the district engineer if: (1) the activity will include a species that has never been cultivated in the waterbody; or (2) the activity occurs in a project area that has not been used for commercial shellfish aquaculture activities during the past 100 years. If the operator will be conducting commercial shellfish aquaculture activities in multiple contiguous project areas, he or she can either submit one PCN for those contiguous project areas or submit a separate PCN for each project area. (See general condition 32.)

In addition to the information required by paragraph (b) of general condition 32, the pre-construction notification must also include the following information: (1) a map showing the boundaries of the project area(s), with latitude and longitude coordinates for each corner of each project area; (2) the name(s) of the species that will be cultivated during the period this NWP is in effect; (3) whether canopy predator nets will be used; (4) whether suspended cultivation techniques will be used; and (5) general water depths in the project area(s) (a detailed survey is not required). No more than one pre-construction notification per project area or group of contiguous project areas should be submitted for the commercial shellfish operation during the effective period of this NWP. The pre-construction notification should describe all species and culture activities the operator expects to undertake in the project area or group of contiguous project areas during the effective period of this NWP. If an operator intends to undertake unanticipated changes to the commercial shellfish aquaculture operation during the effective period of this NWP, and those changes require Department of the Army authorization, the operator must contact the district engineer to request a modification of the NWP verification; a new pre-construction notification does not need to be submitted. (Authorities: Sections 10 and 404)

Note 1: The permittee should notify the applicable U.S. Coast Guard office regarding the project.

Note 2: To prevent introduction of aquatic nuisance species, no material that has been taken from a different waterbody may be reused in the current project area, unless it has been treated in accordance with the applicable regional aquatic nuisance species management plan.

Note 3: The Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 defines “aquatic nuisance species” as “a nonindigenous species that threatens the diversity or abundance of native species or the ecological stability of infested waters, or commercial, agricultural, aquacultural, or recreational activities dependent on such waters.”

1.1 Requirements

General conditions of the NWP are in the Federal Register notice announcing the issuance of this NWP. Pre-construction notification requirements, additional conditions, limitations, and restrictions are in 33 CFR part 330.

1.2 Statutory Authorities

- Section 10 of the Rivers and Harbors Act of 1899 (33 U.S.C. 403)
- Section 404 of the Clean Water Act (33 U.S.C. 1344)

1.3 Compliance with Related Laws (33 CFR 320.3)

1.3.1 General

NWPs are a type of general permit designed to authorize certain activities that have no more than minimal individual and cumulative adverse environmental effects and generally comply with the related laws cited in 33 CFR 320.3. Activities that result in more than minimal individual and cumulative adverse environmental effects cannot be authorized by NWPs. Individual review of each activity authorized by an NWP will not normally be performed, except when pre-construction notification to the Corps is required or when an applicant requests verification that an activity complies with an NWP. Potential adverse impacts and compliance with the laws cited in 33 CFR 320.3 are controlled by the terms and conditions of each NWP, regional and case-specific conditions, and the review process that is undertaken prior to the issuance of NWPs.

The evaluation of this NWP, and related documentation, considers compliance with each of the following laws, where applicable: Sections 401, 402, and 404 of the Clean Water Act; Section 307(c) of the Coastal Zone Management Act of 1972, as amended; Section 302 of the Marine Protection, Research and Sanctuaries Act of 1972, as amended; the National Environmental Policy Act of 1969; the Fish and Wildlife Act of 1956; the Migratory Marine Game-Fish Act; the Fish and Wildlife Coordination Act, the Federal Power Act of 1920, as amended; the National Historic Preservation Act of 1966; the Interstate Land Sales Full Disclosure Act; the Endangered Species Act; the Deepwater Port Act of 1974; the Marine Mammal Protection Act of 1972; Section 7(a) of the Wild and Scenic Rivers Act; the Ocean Thermal Energy Act of 1980; the National Fishing Enhancement Act of 1984; the Magnuson-Stevens Fishery and Conservation and Management Act, the Bald and Golden Eagle Protection Act; and the Migratory Bird Treaty Act. In addition, compliance of the NWP with other Federal requirements, such as Executive Orders and Federal regulations addressing issues such as floodplains, essential fish habitat, and critical resource waters is considered.

1.3.2 Terms and Conditions

Many NWP have pre-construction notification requirements that trigger case-by-case review of certain activities. Two NWP general conditions require case-by-case review of all activities that may adversely affect Federally-listed endangered or threatened species or historic properties (i.e., general conditions 18 and 20, respectively). General condition 16 restricts the use of NWPs for activities that are located in Federally-designated wild and scenic rivers. None of the NWPs authorize the construction of artificial reefs. General condition 28 prohibits the use of an NWP with other NWPs, except when the acreage loss of waters of the United States does not exceed the highest specified acreage limit of the NWPs used to authorize the single and complete project.

In some cases, activities authorized by an NWP may require other federal, state, or local authorizations. Examples of such cases include, but are not limited to: activities that are in marine sanctuaries or affect marine sanctuaries or marine mammals; the ownership, construction, location, and operation of ocean thermal conversion facilities or deep water ports beyond the territorial seas; activities that result in discharges of dredged or fill material into waters of the United States and require Clean Water Act Section 401 water quality certification; or activities in a state operating under a coastal zone management program approved by the Secretary of Commerce under the Coastal Zone Management Act. In such cases, a provision of the NWPs states that an NWP does not obviate the need to obtain other authorizations required by law. [33 CFR 330.4(b)(2)]

Additional safeguards include provisions that allow the Chief of Engineers, division engineers, and/or district engineers to: assert discretionary authority and require an individual permit for a specific activity; modify NWPs for specific activities by adding special conditions on a case-by-case basis; add conditions on a regional or nationwide basis to certain NWPs; or take action to suspend or revoke an NWP or NWP authorization for activities within a region or state. Regional conditions are imposed to protect important regional concerns and resources. [33 CFR 330.4(e) and 330.5]

1.3.3 Review Process

The analyses in this document and the coordination that was undertaken prior to the issuance of the NWP fulfill the requirements of the National Environmental Policy Act (NEPA), the Fish and Wildlife Coordination Act, and other acts promulgated to protect the quality of the environment.

All NWPs that authorize activities that may result in discharges into waters of the United States require water quality certification. NWPs that authorize activities within, or affecting land or water uses within a state that has a Federally-approved coastal zone management program, must also be certified as consistent with the state's program. The procedures to ensure that the NWPs comply with these laws are described in 33 CFR 330.4(c) and (d), respectively.

1.4 Public Comment and Response

For a summary of the public comments received in response to the June 1, 2016, Federal Register notice, refer to the preamble in the Federal Register notice announcing the reissuance of this NWP. The substantive comments received in response to the June 1, 2016, Federal Register notice were used to improve the NWP by changing NWP terms and limits, notification requirements, and/or NWP general conditions, as necessary.

We proposed to modify this NWP to clarify that it authorizes new and continuing commercial shellfish aquaculture operations in authorized project areas. In addition, we proposed to define the project area as the area in which the operator is authorized to conduct commercial shellfish aquaculture activities during the period the NWP is in effect. Also, we proposed to define a “new commercial shellfish aquaculture operation” as an operation in a project area where commercial shellfish aquaculture activities have not been conducted during the past 100 years. We also proposed to modify the PCN thresholds and requirements and those proposed changes are more fully described in the June 1, 2016, proposed rule.

Several commenters expressed their support for the proposed reissuance of this NWP, including the proposed changes. Many commenters objected to the reissuance of this NWP, stating that it authorizes activities with substantial adverse environmental impacts. Several of these commenters said that commercial shellfish aquaculture activities should require individual permits. One commenter remarked that these activities should be authorized by regional general permits instead of an NWP, to take into account regional differences in aquaculture activities and the ecosystems in which they occur. Several commenters stated that NWP 48 does not authorize a category of activities that is similar in nature. Several commenters said that this NWP does not comply with section 404(e) of the Clean Water Act because it has no limits.

The terms and conditions of this NWP, including its PCN requirements, will ensure that commercial shellfish aquaculture activities authorized by this NWP will result in no more than minimal individual and cumulative adverse environmental effects. Any commercial shellfish aquaculture activity to be conducted by a non-federal permittee that might affect Endangered Species Act (ESA) listed species or designated critical habitat, or is located in designated critical habitat, requires a PCN under general condition 18, endangered species. The district engineer will evaluate the PCN, and if he or she determines the proposed activity may affect listed species or designated critical habitat, the district engineer will conduct ESA section 7 consultation with the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service. Division engineers may impose regional conditions to require PCNs for proposed NWP 48 activities that might affect treaty rights, tribal trust resources, submerged aquatic vegetation, or other concerns.

When reviewing a PCN, if the district engineer determines that the proposed activity, after considering mitigation proposed by the prospective permittee, will result in more than minimal individual and cumulative adverse environmental effects, he or she will exercise discretionary authority and require an individual permit for that activity. Commercial

shellfish aquaculture activities occur in various regions of the country, and NWP 48 has been used in Washington State, Alabama, California, Florida, New Jersey, New York, Oregon, and South Carolina. The availability of this NWP reduces the need for the Corps districts in those states to develop regional general permits, and an NWP can promote national consistency in the authorization of these activities.

This NWP only authorizes discharges of dredged or fill material into waters of the United States and structures and work in navigable waters of the United States associated with commercial shellfish aquaculture activities. That is a specific category of activities that is similar in nature. Section 404(e) of the Clean Water Act does not require that general permits, including NWPs, have acreage or other numeric limits. Section 404(e) only requires that general permits authorize categories of activities that are similar in nature that have no more than minimal individual and cumulative adverse environmental effects.

One commenter said that the Corps should clarify the scope of its authority under section 404 of the Clean Water Act as it applies to commercial shellfish aquaculture activities. This commenter expressed the position that these activities are not regulated under section 404. One commenter requested that the Corps add a new Note to NWP 48 that would state that commercial shellfish aquaculture activities are not regulated under section 404 of the Clean Water Act. This commenter said that the Clean Water Act exempts normal farming activities from the requirement to obtain section 404 permits, and that on-going commercial shellfish aquaculture operations are normal farming operations eligible for the Clean Water Act section 404(f)(1)(A) exemption. This commenter remarked that NWP 48 should clearly state that the farming exemption applies to any commercial shellfish aquaculture operation in a project area where those activities have occurred during the past 100 years. This commenter also stated that bottom culture and off-bottom culture shellfish farming activities do not involve regulated discharges of dredged or fill material. This commenter said that sediment movement during shellfish harvesting activities are *de minimis* and should not be regulated under section 404 of the Clean Water Act. This commenter stated that only concentrated aquatic animal production facilities are point source aquaculture operations under the U.S. EPA's National Pollutant Discharge Elimination System regulations issued pursuant to section 402 of the Clean Water Act, and that shellfish farms are not included in EPA's regulations because there is no feed added to the water.

Typical commercial shellfish aquaculture activities, including those described in the provisions of NWP 48, may involve discharges of dredged or fill material into waters of the United States. For example, mechanized harvesting activities typically involve a discharge of dredged or fill material, but the culture of oysters in bags suspended on long-lines, where there is no discharge of shell or gravel for bed preparation, typically does not result in a discharge of dredged or fill material and therefore does not require authorization under section 404 of the Clean Water Act. The term "discharge of dredged material" is defined at 33 CFR 323.2(d). The term "discharge of fill material" is defined at 33 CFR 323.3(f). The U.S. EPA has the authority to make the final determination as to which activities qualify for the exemptions in section 404(f) of the Clean Water Act. That authority is described in the 1989 "Memorandum of Agreement Between the Department of the Army and the Environmental Protection Agency Concerning the Determination of the Geographic Jurisdiction of the Section 404 Program and the Application of the Exemptions Under

Section 404(f) of the Clean Water Act.”

Several commenters said that commercial shellfish aquaculture activities cause minimal adverse environmental effects and that they can have beneficial effects on aquatic habitat and water quality. Many commenters stated that commercial shellfish aquaculture activities cause adverse impacts to intertidal zones, submerged aquatic vegetation (especially eelgrass), community structure and function of intertidal and subtidal habitats, species composition, sediment and water chemistry, soil integrity, impediments to migration, exclusion or displacement of native species, endangered species, competition for food and space, fish spawning and migration areas, and aesthetics.

The effects of commercial shellfish aquaculture activities on the structure, dynamics, and functions of marine and estuarine waters are complicated, and there has been much discussion in the scientific literature on whether those effects are beneficial or adverse (e.g., Dumbauld et al. 2009). Oysters are ecosystem engineers that have substantial impacts on coastal ecosystems by adding habitat for other species, altering ecological and biogeochemical processes, and filtering large volumes of water, thus providing a number of ecosystem goods and services (Ruesink et al. 2005). For example, in Willapa Bay, Washington, two introduced cultured bivalve species (*Crassostrea gigas* and *Ruditapes philippinarum*) have increased secondary production in the waterbody by approximately 2.5 times more than the peak historic secondary production of native oysters (*Ostreola conchaphila*) (Ruesink et al. 2006). Sites where Pacific oysters (*Crassostrea gigas*) are grown provide hard substrate used by fish, invertebrates, and macroalgae in estuaries where such substrate is rare because those estuaries have mostly soft bottom habitats (Ruesink et al. 2006). The scale at which impacts are evaluated is an important factor in determining whether impacts are positive or negative (Dumbauld and McCoy 2015). For example, at a small spatial scale (e.g., the site directly impacted by a specific aquaculture activity) there will be an adverse effect, but at a landscape scale the adverse effects may be minor or there may be beneficial effects because of management approaches and ecosystem resilience (Dumbauld and McCoy 2015).

While commercial shellfish aquaculture activities have some adverse effects on the biotic and abiotic components of coastal waters, including intertidal and subtidal areas, those adverse effects should be considered in a cumulative effects context. Commercial shellfish aquaculture activities also provide some ecosystem functions and services, such as water filtration that removes plankton and particulates from the water column, secondary production that results in food, and habitat for other organisms in the waterbody including fish and invertebrates (Ruesink et al. 2005). Under the Council on Environmental Quality’s definition of “cumulative impact” at 40 CFR 1508.7, cumulative impacts are due to the effects of past, present, and reasonably foreseeable future actions taken by federal, non-federal, and private entities. In 2010, over 123,000,000 people (39 percent of the population of the United States) were living in coastal counties (NOAA and U.S. Census Bureau 2013). Categories of activities that directly and indirectly affect coastal intertidal and subtidal habitats include land use/land cover changes in the watershed (e.g., coastal development, agriculture), pollution from point and non-point sources throughout coastal watersheds, overexploitation of estuarine and marine resources including fish and shellfish, resource extraction, and human activities that contribute to climate change (MEA 2005b).

Commercial shellfish aquaculture activities are a minor subset of human activities that affect coastal intertidal and subtidal habitats and contribute to cumulative effects to those coastal habitats.

Terrestrial areas, which include coastal lands, have been substantially altered by people for millennia (Perring and Ellis 2013). The high proportion of people living along the coasts have directly and indirectly altered coastal waters and their productivity (Vitousek et al. 1997). All marine ecosystems have also been altered to varying degrees by people (Halpern et al. 2008). Nearly all landscapes have been influenced or altered to some extent by past and present use by human communities, resulting in cultural, semi-cultural, and natural landscapes (Clewell and Aronson 2013). The bays and other waterbodies in which commercial shellfish aquaculture activities take place can be considered semi-cultural ecosystems because of their use by people over long periods of time for various activities. While shellfish aquaculture activities have local and temporary effects on the structure, function, and dynamics of estuaries, they do not cause losses of intertidal and subtidal areas or degrade water quality, in contrast to the habitat losses and water quality degradation caused by other types of human activities in or near coastal waters, such as coastal development, pollution, wetland losses, and freshwater diversions (Dumbauld et al. 2009). According to Dumbauld et al. (2009), the disturbances caused by commercial shellfish aquaculture activities are similar in scope and intensity to natural disturbances such as storm events and disturbances caused by other ecosystem engineers such as eelgrass and burrowing shrimp.

Several commenters said that the Corps has not fully documented that commercial shellfish aquaculture activities provide water quality benefits similar to wild bivalves. Many commenters expressed concern about conversions of natural shorelines to commercial shellfish production and impacts to native shellfish, forage fish, salmon, eelgrass, and birds. One commenter stated that a certain amount of natural shoreline should be required between aquaculture sites. One commenter stated that NWP 48 should restrict the use of mechanical harvesting.

Both commercially-grown bivalves and wild bivalves are filter feeding molluscs with the same basic anatomy and physiology. Different oyster species have different filtration rates, with larger oyster species filtering more water (Ruesink et al. 2005). Bivalves influence water quality by filtering out particles from the water column and removing nutrients, which increases the clarity of the water in the waterbody and can help reduce anthropogenic causes of eutrophication (Dumbauld et al. 2009). While commercial shellfish aquaculture activities have some impacts on intertidal and subtidal habitats, fish, eelgrass, and birds, coastal development and other human activities in these waterbodies and the watersheds that drain to these waterbodies have substantial impacts on those resources as well (e.g., MEA 2005b). Commercial shellfish aquaculture activities are conducted near shorelines and coastal lands that have long been occupied and altered by people. The human occupation of these shorelines over time has changed the structure, function, and dynamics of these nearshore ecosystems, including the other species that use those ecosystems. Various coastal development activities have substantially altered shoreline characteristics, as well the water quality of coastal waters and the species that utilize nearshore waters. Shorelines have been altered by a variety of human activities for many years. Land use decisions, including the

use and development of shorelines, is the primary responsibility of state and local governments. States can manage coastal development through their authorities under the Coastal Zone Management Act and state laws. The Corps' authorities are limited to regulating activities that involve discharges of dredged or fill material into waters of the United States and/or structures or work in navigable waters of the United States.

Glascoc and Christy (2004) examined the effects of coastal urbanization on water quality, especially microbial contamination of shellfish production areas. The quality of coastal waters and their habitats are strongly influenced by coastal development, and the pollution generated by the people that live in coastal areas (Glascoc and Christy 2004). They found that non-point source pollution, including pollution from stormwater runoff, wastes generated by livestock on land-based farms, and failing on-site septic systems, is the leading cause of declines in water quality in shellfish growing areas. Point source discharges from industrial and municipal wastewater systems also contribute to declining water quality in estuaries where shellfish production occurs (Glascoc and Christy 2004). While commercial shellfish aquaculture activities do have some adverse effects on eelgrass and other species that inhabit coastal waters, especially competition for space (Tallis et al. 2009), there are also substantial adverse effects caused by coastal land use and land cover changes, other uses of coastal lands and waters by people, and the activities of people who live in these coastal watersheds, especially the pollution they generate through those activities.

Division engineers can also add regional conditions to ensure that mechanical harvesting activities that require Department of the Army authorization result in no more than minimal individual and cumulative adverse environmental effects.

Several commenters asserted that the use of canopy nets has caused extensive modification of shorelines. They said these nets also make it difficult for birds to feed and may trap birds. One commenter stated that commercial shellfish aquaculture operators should not be allowed to harass birds and use large canopy net to keep birds from feeding on planted shellfish. One commenter remarked that the Corps must comply with regulations to protect migratory birds. Many commenters also expressed concern about use of chemicals to remove eelgrass and native invertebrates, the introduction of non-native species, the introduction of plastics into the marine food web, and risks of parasitism and disease.

The use of canopy nets and their effects on birds are more appropriately addressed by district engineers on a case-by-case basis if the use of canopy nets is directly linked to commercial shellfish aquaculture activities that require DA authorization. General condition 19 addresses the requirements of the Migratory Bird Treaty Act. The Corps does not have the authority to regulate discharges of pesticides. Discharges of pesticides may require authorization by states or the U.S. EPA under section 402 of the Clean Water Act. Division engineers can impose regional conditions to address the use of plastics, if plastic materials are used for the activities regulated under the Corps' authorities.

Invasions of species from one area to another is a natural biological phenomenon, while human activities have greatly sped up the rates of those invasions (Vitousek et al. 1997). Introductions of non-native species occur through a variety of mechanisms, such as land use/land cover changes, commerce (e.g., intentional introductions), and inadvertent

introductions due to accidental transport (Vitousek et al. 1997), not just commercial shellfish aquaculture activities. Most ecosystems and human dominated lands are inhabited by native and non-native species and ecosystems, including their species composition, are changing a very rapid rate (Davis et al. 2011). The Corps does not have the authority to regulate the introduction of non-native species into waterbodies. In addition, the Corps does not have the authority to address risks of parasitism and disease from shellfish production or consumption. Those concerns are more appropriately addressed by state or local public health agencies.

Many commenters also said that there has not been a sufficient cumulative impact analysis conducted for NWP 48. One commenter said that the Corps needs to track cumulative impacts of these activities.

The cumulative effects analyses prepared by Corps Headquarters for the reissuance of this NWP were done in accordance with the definitions of “cumulative impact” provided in the applicable federal regulations. For the environmental assessment in the national decision document, we used the definition of “cumulative impact” in the Council on Environmental Quality’s NEPA regulations at 40 CFR 1508.7. For the 404(b)(1) Guidelines analysis in the national decision document, we predicted cumulative effects using the approach specified at 40 CFR 230.7(b)(3), which states that the permitting authority is to predict the number of activities expected to occur until the general permit expires. Corps districts track the use of NWP 48 and other NWPs in our automated information system, ORM2. In ORM2, we track NWP activities that require PCNs as well as NWP activities that do not require PCNs but are voluntarily reported to Corps districts in cases where the project proponents want written verifications from the Corps.

Many commenters objected to the proposed definition of “new commercial shellfish aquaculture operation” which stated that it is “an operation in an area where commercial shellfish aquaculture activities have not been conducted during the past 100 years.” Many commenters objected to using 100 years as a threshold for identifying new commercial shellfish aquaculture activities. These commenters stated that the proposed definition would greatly expand fallow shellfish aquaculture areas, which they assert have recovered to their former natural state. Several of these commenters said that the proposed definition “grandfathers” commercial shellfish aquaculture operations, in contrast to the five year limits of other NWPs. One commenter recommended changing the threshold from 100 years to 5 years and another commenter suggested changing it to 4 years. Several commenters objected to paragraph (d) of the proposed NWP, which prohibits commercial shellfish aquaculture activities that directly affect more than 1/2-acre of submerged aquatic vegetation beds in project areas that have not been used for those activities during the past 100 years. They said that this paragraph essentially places no limits on the amount of submerged aquatic vegetation that can be disturbed by these activities.

Paragraph (d) of the proposed NWP 48 is linked to the proposed definition of “new commercial shellfish aquaculture operation” in the first paragraph of the proposed NWP as well as the definition of “project area.” Our intent with the definition of “new commercial shellfish aquaculture operation” and the 100-year period is to recognize that many of these activities have taken place over long periods of time, even though some sections of project

areas may have been fallow for a number of years. The long time frame provided by the 100-year period is also in recognition that commercial shellfish aquaculture activities do not cause losses of intertidal and subtidal habitats and that components of those intertidal and subtidal ecosystems (e.g., submerged aquatic vegetation, benthic organisms, and nekton that utilize those habitats) are resilient to the impacts of these activities and other disturbances. In general, those groups of organisms recover in a relatively short time after disturbances caused by planting, harvesting, or other commercial shellfish aquaculture activities. The Corps' regulatory authorities are limited to discharges of dredged or fill material into waters of the United States and structures or work in navigable waters, and the direct and indirect effects caused by those activities. The use of rotation cycles for farmed and fallow areas of commercial shellfish aquaculture operations will not affect the Corps' determination of eligibility for NWP 48 authorization. This is because the Corps considers the entire project area, as well as the description of the 5-year commercial shellfish activity provided in the PCN in the context of the overall ecosystem function, when determining whether the proposed activities will, or will not, result in no more than minimal adverse environmental effects, and thus qualify, or not, for NWP 48 authorization.

In addition, commercial shellfish aquaculture activities and submerged aquatic vegetation have been shown to co-exist with each other. The combination of shellfish and submerged aquatic vegetation provides a number of ecosystem functions and services (Dumbauld and McCoy 2015). Submerged aquatic vegetation is resilient to disturbances caused by oyster aquaculture activities, and the disturbances caused by oyster aquaculture activities are comparable to natural disturbances caused by winter storms (Dumbauld and McCoy 2015). Intertidal and subtidal marine and estuarine ecosystems, as well as other ecosystems, are dynamic, not static. As long as ecosystems are not too degraded by human activities and other environmental factors, they have resilience to recover after disturbances. Compared to the disturbances and degradation caused by coastal development, pollution, and other human activities in coastal areas, commercial shellfish aquaculture activities present relatively mild disturbances to estuarine and marine ecosystems. Dumbauld et al. (2009) presents a review of empirical evidence of the resilience of estuarine ecosystems and their recovery (including the recovery of eelgrass) after disturbances caused by shellfish aquaculture activities. Because of the demonstrated co-existence of shellfish aquaculture and submerged aquatic vegetation and their resilience to withstand disturbances, we do not believe it is necessary to impose buffers around submerged aquatic vegetation beds. In areas where there are concerns regarding impacts to submerged aquatic vegetation, division engineers can modify NWP 48 to require PCNs for all activities, so that district engineers can review each proposed NWP 48 activity to ensure that those activities result in no more than minimal individual and cumulative adverse effects on submerged aquatic vegetation.

One commenter expressed concern that the proposed definition of "new commercial shellfish aquaculture operation" would adversely affect treaty rights. One commenter said that the Corps has no legal basis to apply the 100-year threshold to tribal uses or treaty rights. Several commenters recommended reverting back to the requirements in the 2007 NWP 48, which limited commercial shellfish aquaculture operations to the "the area of waters of the United States occupied by the existing operation." These commenters also suggested an alternative of limiting new commercial shellfish aquaculture activities to areas where the operator can document that those areas have been part of a regular rotation of

cultivation. One commenter stated that U.S. v. Washington subproceeding No. 89-3 set forth specific requirements to prove prior aquaculture activities and that these same requirements should be used for NWP 48. Several commenters expressed concern about the unknown quantity of new operations that would occur because of the 100-year threshold, the lack of a baseline, the lack of harvest records, cumulative impacts of changes to aquaculture species, and the potential to harm other species, including species listed under the Endangered Species Act. One commenter stated that large shellfish corporations have been gathering large numbers of leases in anticipation of the adoption of the 100-year threshold in NWP 48.

The definition of “project area” is focused on the geographic area in which the operator is authorized to conduct commercial shellfish aquaculture activities through a variety of instruments, including treaties. All NWP activities, including NWP 48 activities, must comply with general condition 17, tribal rights. General condition 17 has been modified to state that no NWP activity may cause more than minimal adverse effects to tribal rights (including treaty rights), protected tribal resources, or tribal lands. Division engineers can add regional conditions to this NWP to ensure that commercial shellfish aquaculture activities do not result in more than minimal adverse effects on tribal rights. These regional conditions may require PCNs for activities that might have the potential to affect tribal rights (including treaty rights), protected tribal resources, or tribal lands, to provide district engineers the opportunity to consult with the appropriate tribe(s) to ensure that the NWP activity complies with general condition 17. If the district engineer is uncertain whether a proposed NWP 48 activity might cause more than minimal adverse effects on tribal rights, protected tribal resources, or tribal lands, he or she should consult with the appropriate tribe or tribes, as well as his or her Office of Counsel staff, to understand the relevant treaty or treaties and applicable case law when determining the applicability of NWP 48.

We do not agree that NWP 48 should revert to the 2007 terms and conditions of that NWP, which limited the project area to the area for an existing commercial shellfish aquaculture activity. After the experience of implementing the 2007 and 2012 versions of NWP 48, as well as our understanding of the no more than minimal adverse environmental effects caused by these activities, we believe the definition of project area in this NWP, as well as the 100-year threshold, is appropriate to allow long established commercial shellfish aquaculture operations to be authorized by this NWP. This approach takes into account the dynamic nature of these operations over space and time, and does not discourage shellfish growers from letting portions of their project areas go fallow for periods of time.

Nationwide permits, as well as other DA permits, do not grant any property rights or exclusive privileges (see 33 CFR 330.4(b)(3) and 33 CFR 325, Appendix A). If the operator has an enforceable property interest established through a lease or permit issued by an appropriate state or local government agency, a treaty, or any easement, lease, deed, contract, or other legally binding agreement, then the activity can be authorized by NWP 48 as long as the operator complies with all applicable terms and conditions of the NWP, including regional conditions imposed by the division engineer and activity-specific conditions imposed by the district engineer. As discussed above, we believe that commercial shellfish aquaculture activities that comply with the terms and conditions of NWP 48 will have no more than minimal individual and cumulative adverse environmental effects because the disturbances caused by these activities on intertidal and subtidal

ecosystems are temporary and those ecosystems have demonstrated their ability to recover from those temporary disturbances. These activities will cause little change to the environmental baseline of these intertidal and subtidal areas. They cause far less change to the environmental baseline than the adverse effects caused by development activities, pollution, and changing hydrology that results from the people living and working in the watersheds that drain to coastal waters where commercial shellfish aquaculture activities occur. To comply with the requirements for general permits issued under its authorities (i.e., section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act of 1899), we do not need to examine historic records of harvests or cultivated species. Many species co-exist with commercial shellfish aquaculture activities and many species benefit from these activities (Dumbauld et al. 2009). Compliance with the Endangered Species Act is achieved through the requirements of general condition 18, and activity-specific and regional programmatic ESA section 7 consultations.

The 100-year threshold is used only to identify new commercial shellfish aquaculture activities for the purposes of applying the 1/2-acre limit for direct effects to submerged aquatic vegetation. If a commercial shellfish aquaculture activity is identified as a new activity and it will directly affect more than 1/2-acre of submerged aquatic vegetation, then the proposed activity does not qualify for NWP 48 authorization and an individual permit or a regional general permit would be required.

A couple of commenters supported the proposed 100-year threshold for identifying new commercial shellfish aquaculture operations because portions of shellfish farms lie fallow for extended periods of time. One commenter suggested modifying the definition to refer to a “project area” instead of an “area” because the term “project area” is used throughout the NWP. This commenter said that the general term “area” could be interpreted as applying to a smaller portion of the “project area.” This commenter also recommended using the term “project area” in paragraph (d) of this NWP.

We have changed “an area” to “a project area” to consistently refer to “project area” throughout the text of NWP 48. We have modified paragraph (d) to refer to “project area” instead of “area.” Paragraph (a) of this NWP states that the NWP does not authorize the cultivation of a nonindigenous species unless that species has been previously cultivated in the waterbody. The first PCN threshold in the “Notification” paragraph states that a PCN is required if the proposed NWP activity will include a species that has never been cultivated in the waterbody. To clarify the relationship between the prohibition in paragraph (a) and this PCN threshold, if an operator proposes to cultivate a nonindigenous species in the waterbody that has never been cultivated in that waterbody, an individual permit is required. If the operator wants to continue to grow that nonindigenous species in the waterbody after the 2017 NWP 48 expires, the regulated activities associated with the continued cultivation of that nonindigenous species could be authorized by future versions of NWP 48, if NWP 48 is reissued and the terms and conditions of the future NWP 48s are the same as the 2017 NWP 48.

One commenter referenced NWPs 19 and 27 and their restrictions or prohibitions of impacts to submerged aquatic vegetation and said that similar limitations should be placed on NWP 48. One commenter stated that commercial shellfish aquaculture activities should be separated by submerged aquatic vegetation beds by buffers that are a minimum of 25 feet

wide. One commenter said that the Corps has ignored the recommendations of other federal agencies relating to the protection of eelgrass. One commenter stated that this NWP should impose strict limits on these activities.

Nationwide permit 19 prohibits dredging in submerged aquatic vegetation because the dredging may result in water depths in which the submerged aquatic vegetation might take a long time to recover. Nationwide permit 27 authorizes aquatic habitat restoration, enhancement, and establishment activities, as long as those activities result in net increases in aquatic resource functions and services. Nationwide permit 27 prohibits the conversion of tidal wetlands to other uses, including the explicit prohibition against the construction of oyster habitat in vegetated tidal waters, to help ensure that there are not trade-offs that will result in net decreases in aquatic resource functions and services. The terms and conditions of NWP 48 serve a different purpose: to authorize commercial shellfish aquaculture activities that require DA authorization and result in no more than minimal individual and cumulative adverse environmental effects. In areas where there are concerns about cumulative effects to eelgrass or other species inhabiting areas where commercial shellfish aquaculture activities occur, division engineers can impose regional conditions to restrict or prohibit the use of this NWP.

One commenter stated that commercial shellfish aquaculture activities should be at least 100 feet from spawning areas to protect the species that spawn in those areas. In addition, this commenter said that this NWP should impose time-of-year restrictions to minimize impacts during spawning seasons. One commenter said that NWP 48 should not authorize activities that involve the cultivation of non-native species.

General condition 3, spawning areas, requires NWP activities to avoid, to the maximum extent practicable, being conducted in spawning areas during spawning seasons. We do not believe it is necessary, at a national level, to impose a buffer from spawning areas. Division engineers may impose regional conditions to restrict or prohibit NWP activities during certain periods during a year, such as spawning seasons. District engineers can impose similar conditions on specific NWP activities by adding conditions to the NWP authorization on a case-by-case basis. We do not agree that NWP 48 should be limited to the cultivation of native shellfish species. Five of the nine species of shellfish commonly cultivated on the west coast for commercial production are native species, and the other four species are from Europe or Asia. On the west coast, introduced shellfish species have been cultivated for decades (Ruesink et al. 2006), and are an important commercial commodity that provides more food for people than native oyster species.

One commenter said that the definition of “project area” could be interpreted in two different ways. One interpretation could be that the project area is the area in which an agreement specifically authorizes the operator to conduct aquaculture activities. Another interpretation could be that the project area is the area where a legally binding agreement establishes an enforceable property interest for the operator. This commenter stated that the proposed definition could mean that anyone who has a property interest in tidelands is also authorized to conduct commercial shellfish aquaculture activities. This commenter suggested modifying the definition of project area as: “the area in which the operator conducts commercial shellfish aquaculture activities, as authorized by a lease or permit or other legally binding agreement.”

The definition of “project area” can be applied under either approach, depending on other laws and regulations that apply to areas that could be used for commercial shellfish aquaculture activities. An operator might not have an enforceable property interest because the state might own the subtidal lands that are needed for commercial shellfish aquaculture activities, but the state might issue a permit that allows that operator to conduct those activities on state submerged lands. In other states, the operator might be granted an enforceable property interest through an easement, lease, deed, contract, or other legally binding agreement to do commercial shellfish aquaculture. For example, in Washington State in 1895, the Bush and Callow Acts allowed nearly 19,000 acres of tidelands to be deeded for private ownership for the specific purpose of commercial shellfish aquaculture (Dumbauld et al. 2009). We believe the proposed definition is needed to provide clarity on the various types of instruments that could be used to establish an enforceable property interest for the grower, and provide flexibility to authorize these activities.

One commenter expressed support for the proposed definition of “project area” by including a lease or permit issued by an appropriate state or local government agency because such a lease or permit establishes a clear use or a clear intention of use of an area. A couple of commenters said that the definition of “project area” should not refer to deeds. One commenter said that in the State of Washington, large areas of tidelands were sold by the state that were made unsuitable for cultivation, but since those sales were made aquaculture practices have changed and those areas can now be used for cultivation.

A deed might be an appropriate instrument for conveying an enforceable property interest, depending on state law. If the tidelands can now be used for commercial shellfish aquaculture, even if they were unsuitable at the time the land was sold, then those activities can be authorized by NWP 48 if they require DA authorization.

One commenter requested that the NWP define “commercial shellfish aquaculture operations” and that the definition must not conflict with a tribe’s treaty-secured rights to take shellfish. Another commenter suggested adding a definition of “existing activity,” and define that term as the area under cultivation when NWP was first issued in 2007 or where the operator can document that the area has been subject to a regular rotation of cultivation.

We do not think it is necessary to define the term “commercial shellfish aquaculture activity” in the text of the NWP. It is simply the commercial production of shellfish. General condition 17 states that NWP activities cannot cause more than minimal adverse effects on tribal rights (including treaty rights), protected tribal resources, or tribal lands. If there are disputes between operators with valid commercial shellfish aquaculture permits or leases or other enforceable property interests, and a tribe’s rights under one or more treaties to take shellfish, those disputes need to be resolved by the appropriate authorities. It is not necessary to define “existing activity” in NWP 48 because the NWP is because NWP 48 authorizes existing commercial shellfish aquaculture activities as long as they have been conducted in the project area at some time during the past 100 years.

Two commenters voiced their support for the proposed changes to the PCN requirements for

this NWP. Several commenters objected to the proposed removal of the PCN threshold for dredge harvesting, tilling, or harrowing in areas inhabited by submerged aquatic vegetation because they said submerged aquatic vegetation is important habitat. One commenter said the proposed removal of this PCN threshold is contrary to the Corps' and the Department of Defense's tribal consultation policies. One commenter said that a PCN should be required for an NWP 48 activity if the proposed activity will include a species that has never been cultivated in the waterbody, or the proposed activity occurs in a project area that has not been used for commercial shellfish aquaculture activities during the past 100 years.

We have determined it is no longer necessary to require PCNs for dredge harvesting, tilling, or harrowing activities in areas inhabited by submerged aquatic vegetation because the submerged aquatic vegetation recovers after those disturbances occur. In a geographic area where dredge harvesting, tilling, or harrowing activities might result in more than minimal adverse effects to submerged aquatic vegetation, the division engineer can add regional conditions to this NWP to require PCNs for those activities. The removal of this PCN requirement is not contrary to Corps tribal consultation policies and the Department of Defense American Indian and Alaska Native Policy, because those policies do not directly address commercial shellfish aquaculture activities in areas inhabited by submerged aquatic vegetation. In addition, for the 2017 NWPs, Corps districts are consulting with tribes, and those consultations may result in regional conditions that address tribal concerns about impacts to submerged aquatic vegetation. Those consultations may also result in the development of procedures for coordinating NWP 48 PCNs with tribes before making decisions on whether to issue NWP 48 verifications to ensure that NWP 48 activities do not cause more than minimal adverse effects to treaty fishing rights or other tribal rights. A division engineer can impose a regional condition to require PCNs for dredge harvesting, tilling, or harrowing activities in areas inhabited by submerged aquatic vegetation, if he or she determines such a regional condition is necessary to ensure that NWP 48 activities cause no more than minimal individual and cumulative adverse environmental effects, which includes adverse effects to tribal rights (including treaty rights), protected tribal resources, and tribal lands. We have retained the proposed PCN thresholds in the final NWP.

Several commenters objected to the proposed removal of the PCN threshold for activities that involve a change from bottom culture to floating or suspended culture. One commenter stated that floating aquaculture facilities should be required to complete benthic surveys to adequately evaluate impacts to the benthos. Several commenters said that notification to tribes is important to avoid tribal treaty fishing access issues, especially in situations where the operator is proposing to change from bottom culture to suspended culture. These commenters stated that suspended culture can impact tribal net fisheries. One commenter stated that floating aquaculture disrupts the ability of the tribe to exercise their treaty rights as overwater structures interfere with net fisheries and takes away surface water areas of usual and accustomed fishing areas.

Because of the terms and conditions of this NWP, the activities it authorizes will result in no more than minimal individual and cumulative adverse environmental effects. The intertidal and subtidal habitats in which these activities occur are dynamic systems that recover after the short-term disturbances caused by commercial shellfish aquaculture activities and other

short-term activities or natural events. The short-term disturbances caused by bottom culture versus floating culture are not substantive enough to warrant requiring PCNs for those changes in culture methods. Given the dynamic nature of these intertidal and subtidal ecosystems, the ecological benefits of commercial shellfish aquaculture activities, and the minimal disturbances those activities cause, we do not believe it is necessary to require benthic surveys. For the 2017 NWP, Corps districts have been consulting with tribes to identify regional conditions to protect tribal rights (including treaty rights), protected tribal resources, or tribal lands and ensure compliance with revised general condition 17, tribal rights. District engineers can also develop coordination procedures with interested tribes to ensure that proposed NWP 48 activities do not cause more than minimal adverse effects on tribal rights, protected tribal resources, or tribal lands. If an operator is authorized to conduct a commercial shellfish aquaculture activity because he or she was granted a permit, lease, or other enforceable property interest, and there is a dispute regarding the effects of that activity on net fisheries conducted by tribes, then that dispute needs to be resolved by the appropriate authorities.

Two commenters objected to the proposed change in the PCN threshold from “new project area” to an “area that has not been used for commercial shellfish aquaculture activities during the past 100 years.” One commenter said tribes require notification and opportunity to comment on shellfish aquaculture projects as they may have impacts to treaty rights. One commenter said by defining new commercial shellfish aquaculture operations as operations occurring within the footprint of a previously authorized lease site within the past 100 years, almost all leases in North Carolina would be considered “new operations” and potentially require PCNs.

The proposed change in that PCN threshold is consistent with the proposed definition of “new commercial shellfish aquaculture operation.” For this NWP, Corps districts can develop coordination procedures with interested tribes to help district engineers determine whether proposed NWP 48 activities comply with general condition 17, tribal rights. Division engineers can add regional conditions to this NWP to require PCNs for NWP 48 activities that have the potential to affect treaty rights, so that districts can review those activities and consult with the tribes that might be affected. The definition of “new commercial shellfish aquaculture activities” and the associated PCN threshold do not require existing commercial shellfish aquaculture activities to have continuously conducted those activities in the project area for 100 years. Those activities only need to be conducted for some period of time during that 100-year period. Those activities may have been conducted by different operators over time. For example, if a particular tract has been used for commercial shellfish aquaculture during the past 100 years, and that tract has been transferred or leased to a different commercial shellfish aquaculture operator then that tract is not considered a “new” project area. As explained in the proposed rule, for NWP 48 we are including areas that have been fallow for some time as part of the “project area.” We have also modified the “Notification” paragraph to state that if the operator will be conducting commercial shellfish aquaculture activities in multiple contiguous project areas, he or she has the option of either submitting one PCN for those contiguous project areas or submitting a separate PCN for each project area. We also made conforming changes to the last paragraph of NWP 48 to reference the project area or a group of contiguous project

areas.

Two commenters suggested adding text to paragraph describing the information to be included in an NWP 48 PCN. Their suggested text is: “No more than one pre-construction notification must be submitted for a commercial shellfish operation during the effective term of this permit. The PCN may include all species and culture activities that may occur on the project area during the effective term of the permit. If an operator intends to undertake unanticipated changes to the commercial shellfish operation during this period, and those changes involve activities regulated by the Corps, the operator may contact the Corps district to request a modification of the NWP verification, instead of submitting another PCN. If the Corps does not deny such a modification request within 14 days, it shall be deemed approved.” As an alternative to including this text in the terms of NWP 48, these commenters said that there could be a form signed by the operator in which he or she attests that there will be no changes in operation during the five year period this NWP is in effect.

We have added the suggested text to that paragraph, with some modifications. If the operator requests a modification of the NWP verification, he or she must wait for the verification letter from the district engineer. We cannot include a 14-day default approval of a proposed modification. For example, the proposed modification may trigger a need to re-initiate ESA section 7 consultation if the prior NWP verification was for an activity that required an activity-specific ESA section 7 consultation. The added text to the paragraph discussing the information to be included in a PCN is a more appropriate means of reducing the number of PCNs that need to be submitted during the five year period this NWP is in effect. The development of a new form would likely require review and approval under the Paperwork Reduction Act. The added text to the “Notification” paragraph is a more efficient alternative to developing a new form.

One commenter said that NWP 48 PCNs should include information demonstrating compliance with the limits on impacts to submerged aquatic vegetation, providing mitigation for impacts to submerged aquatic vegetation and other special aquatic sites. One commenter stated that PCNs should include recent surveys identifying eelgrass, macroalgae, and forage fish. Several commenters said that PCNs should be required for each commercial shellfish aquaculture operation (i.e., farm). Several commenters stated that any conversions of natural intertidal areas to intensive aquaculture farms should require PCNs. One commenter remarked that the PCN should state whether the operator will be applying pesticides to manage ghost shrimp or sand shrimp, which pesticides he or she will use, and if the operator will be using neonicotinoids.

As discussed above, we believe that the activities authorized by NWP 48 will have no more than minimal individual and cumulative adverse environmental effects on submerged aquatic vegetation and other special aquatic sites. The only limit to impacts to submerged aquatic vegetation is the 1/2-acre limit that applies to new commercial shellfish aquaculture operations. In areas where a Corps district determines that NWP 48 activities may have more than minimal adverse effects on submerged aquatic vegetation or other special aquatic sites, the district can request that the division engineer add a regional condition to this NWP to require PCNs for activities that have impacts to submerged aquatic vegetation or other

special aquatic sites or impose limits on impacts to submerged aquatic vegetation or other special aquatic sites. As stated in paragraph (b)(5) of general condition 32, if a PCN is required then the PCN must include a delineation of special aquatic sites. We do not think it is necessary to require NWP 48 PCNs to include surveys of macroalgae or forage fish. Only NWP 48 activities that trigger one or both PCN thresholds in the “Notification” paragraph require PCNs. Pre-construction notifications are also required for proposed activities to be conducted by non-federal permittees that trigger the PCN requirements in paragraph (c) of general condition 18, which addresses compliance with the Endangered Species Act. We do not think it is necessary to require PCNs for each farm. If there are concerns within a particular region regarding conversions of intertidal areas to commercial shellfish aquaculture, the division engineer can modify this NWP to add PCN requirements for those activities. The Corps does not have the authority to regulate the use of insecticides and other pesticides, so we cannot modify the PCN requirements to gather that information. The use of insecticides and other pesticides may be regulated under other federal or state laws.

Many commenters said that mitigation should be required for all impacts to submerged aquatic vegetation and other special aquatic sites. Several commenters asserted that compensatory mitigation should be required for conversions of intertidal and subtidal areas. Several commenters stated that if the NWP 48 activity does not require a PCN, then compensatory mitigation cannot be required. One commenter said that compensatory mitigation should be required for the following activities: removal of embedded natural rocks, shells, et cetera; removal or relocation of aquatic life; clearing native aquatic vegetation; grading, filling or excavation of tidelands; adding gravel or shell to make tidelands suitable for aquaculture; operations near intertidal forage fish spawning sites; unnaturally high densities of filtering bivalves; plastic and canopy pollution from aquaculture gear; and the effects of periodic substrate harvest. Many commenters indicated that commercial shellfish aquaculture activities have adverse effects on aquatic ecosystems because they use large amounts of plastic. These plastics include PVC tubes, poly lines, and synthetic canopy nets. One commenter said that plastics pose threats to human and aquatic life. One commenter stated that the Corps failed to adequately describe the possible direct, indirect, and cumulative effects caused by commercial shellfish aquaculture activities or how Corps district might require mitigation measures to ensure that the adverse environmental effects of these activities are no more than minimal.

Commercial shellfish aquaculture activities are compatible with submerged aquatic vegetation and other special aquatic sites, because those special aquatic sites quickly recover after disturbances caused by those aquaculture activities. Commercial shellfish aquaculture activities also provide important ecological functions and services. Therefore, as a general rule, we do not believe that these activities should require compensatory mitigation. We agree that if an NWP 48 activity does not require a PCN and the project proponent does not submit a voluntary request for an NWP verification, then the district engineer cannot require compensatory mitigation. None of the activities listed by these commenters in the preceding paragraph would normally result in a compensatory mitigation requirement, primarily because they are unlikely to cause resource losses that would result in more than minimal adverse environmental effects. Trash, garbage, and plastic wastes are not considered fill material regulated under section 404 of the Clean Water Act (see 33 CFR 323.2(e)(3), which

excludes trash and garbage from the definition of “fill material”). As discussed above, we believe that the adverse effects of commercial shellfish aquaculture activities that comply with the terms and conditions of this NWP, including regional conditions imposed by division engineers and activity-specific conditions imposed by district engineers, will result in only minimal individual and cumulative adverse environmental effects.

Many commenters said that the terms and conditions of NWP 48 are not sufficient to protect species listed under the Endangered Species Act. Two commenters said that for NWP 48 the Corps must conduct ESA section 7 consultation and essential fish habitat consultation. One commenter stated that the Corps does not have enough staff to monitor compliance with those terms and conditions.

All activities authorized by this NWP must comply with general condition 18, endangered species. Paragraph (c) of general condition 18 requires that a non-federal permittee submit a PCN if any listed species or designated critical habitat might be affected or is in the vicinity of the activity, or if the activity is located in designated critical habitat. Corps districts will conduct ESA section 7 consultation for any activity proposed by a non-federal applicant that may affect listed species or designated critical habitat. The Corps district may conduct either formal or informal section 7 consultations, depending on whether there will be adverse effects to listed species or designated critical habitat. Corps districts may also conduct regional programmatic ESA section 7 consultations, if appropriate. For proposed NWP 48 activities that may adversely affect essential fish habitat, district engineers will conduct essential fish habitat consultation with the appropriate office of the National Marine Fisheries Service. District engineers may also conduct regional programmatic essential fish habitat consultations. Corps districts have sufficient staff and other resources to monitor compliance with the terms and conditions of NWP 48 and the other NWPs.

Several commenters stated that commercial shellfish aquaculture activities pose navigation hazards because netting can become caught on boat props and wind surfers, limiting the use of waters of safe recreation and navigation. Two commenters said that the Corps should coordinate with Puget Sound recovery goals and should use the Puget Sound model to identify where impacts from NWP 48 activities are likely to occur and may result in more than minimal individual and cumulative adverse environmental effects.

All NWP 48 activities must comply with general condition 1, navigation. The U.S. Coast Guard may require the operator to install aids to navigation to ensure that boaters and recreational users of the waterbody do not accidentally encroach on the structures in navigable used for the commercial shellfish aquaculture activities. Note 1 recommends that the permittee contact the U.S. Coast Guard. The locations for NWP 48 activities will be identified through permits or leases or other instruments or documents that establish enforceable property interests for the operators. Corps participation in Puget Sound recovery goals is more appropriately conducted at the Corps district level, in coordination with the Corps division office, rather than a rulemaking effort by Corps Headquarters (i.e., the reissuance of this NWP). Any regional conditions added to NWP 48 to support Puget Sound recovery goals must be approved by the division engineer.

Several commenters said that the draft decision document does not comply with the requirements of the National Environmental Policy Act (NEPA). Several commenters asserted that the reissuance of NWP 48 requires an environmental impact statement. Several commenters said that the draft decision document for NWP 48 did not provide sufficient information on cumulative impacts and the potential effects of NWP 48 activities, and insufficient analysis of information to support a no more than minimal adverse environmental effects determination. Commenters also stated that the decision document did not include monitoring requirements. One commenter noted that the draft decision document stated that NWP 48 would result in impacts to approximately 56,250 acres of waters of the United States, including wetlands, and no compensatory mitigation would be required to offset those impacts. Several commenters said that the Corps did not present any peer reviewed scientific studies that have examined the effects of commercial shellfish aquaculture on natural shorelines, aquatic species, and birds. One commenter said that the Corps made no effort to provide information to the public on impacts of past NWP 48 activities, and there is no system in place to monitor and evaluate these impacts.

We believe that the final decision document fully addresses the requirements of NEPA, the 404(b)(1) Guidelines, and the Corps' public interest review. We prepared an environmental assessment with a finding of no significant impact to fulfill NEPA requirements. Therefore, an environmental impact statement is not required for the reissuance of this NWP. In addition, we determined that the reissuance of this NWP complies with the 404(b)(1) Guidelines. We also determined that the reissuance of this NWP, with the modifications discussed above, is not contrary to the public interest.

The NWP does not include explicit monitoring requirements. District engineers can conduct compliance inspections on NWP 48 activities, to ensure that the operator is complying with all applicable terms and conditions of this NWP, including any regional conditions imposed by the division engineer and activity-specific conditions imposed by the district engineer. If the district engineer determines that the permittee is not complying with those terms and conditions, he or she will take appropriate action. While the decision document states that we estimate that NWP 48 activities will impact approximately 56,250 acres of jurisdictional waters and wetlands during the 5-year period this NWP is in effect, it is important to remember that the vast majority of activities authorized by this NWP are on-going recurring activities in designated project areas. Many of these activities have been conducted in these project areas for decades. It is also important to understand that these activities do not result in losses of jurisdictional waters and wetlands and that their impacts are temporary. The estuarine and marine waters affected by these activities recover after the disturbances caused by shellfish seeding, rearing, cultivating, transplanting, and harvesting activities. Those temporary impacts and the recovery of ecosystem functions and services results in no losses that require compensatory mitigation.

In this final rule, as well as the decision document, we discuss the effects of commercial shellfish aquaculture on natural shorelines, aquatic species, and birds. The Corps is not required to provide the public with information on the past use of NWP 48. The NEPA cumulative effects analysis in the decision document for this NWP includes past commercial shellfish aquaculture activities as the present effects of past actions.

Several tribes requested the development of regional conditions to address tribal concerns about NWP 48 activities. One commenter said that regional conditions must be consistent with treaty-reserved rights and support protection of nearshore habitat. One commenter said that NWP 48 is used a lot in some areas of the country, and that commenter believes that high usage results in more than minimal cumulative adverse environmental effects. One commenter recommended transferring the responsibility for processing NWP 48 PCNs for commercial shellfish aquaculture activities in Washington State to either North Pacific Division or Corps Headquarters.

The development of regional conditions is achieved through efforts conducted by the division engineer and the Corps district, and the approval of the regional conditions is made under the division engineer's authority. For the 2017 NWPs, Corps districts conducted consultation with tribes to develop regional conditions for this NWP and other NWPs. Those regional conditions can help ensure compliance with general condition 17, tribal rights, so that no NWP 48 activity will cause more than minimal adverse effects on reserved tribal rights (including treaty rights), protected tribal resources, or tribal lands. Division engineers can also modify, suspend, or revoke this NWP in geographic areas where there may be more than minimal individual and cumulative adverse environmental effects. Examples of such geographic areas include specific waterbodies, watersheds, ecoregions, or counties. Review of NWP 48 PCNs is the responsibility of Corps districts, and Corps divisions have oversight over their districts.

2.0 Alternatives

This evaluation includes an analysis of alternatives based on the requirements of NEPA, which requires a more expansive review than the Clean Water Act Section 404(b)(1) Guidelines. The alternatives discussed below are based on an analysis of the potential environmental impacts and impacts to the Corps, Federal, Tribal, and state resource agencies, general public, and prospective permittees. Since the consideration of off-site alternatives under the 404(b)(1) Guidelines does not apply to specific projects authorized by general permits, the alternatives analysis discussed below consists of a general NEPA alternatives analysis for the NWP.

2.1 No Action Alternative (No Nationwide Permit)

The no action alternative would not achieve one of the goals of the Corps Nationwide Permit Program, which is to reduce the regulatory burden on applicants for activities that result in no more than minimal individual and cumulative adverse environmental effects. The no action alternative would also reduce the Corps ability to pursue the current level of review for other activities that have greater adverse effects on the aquatic environment, including activities that require individual permits as a result of the Corps exercising its discretionary authority under the NWP program. The no action alternative would also reduce the Corps ability to conduct compliance actions.

If this NWP is not available, substantial additional resources would be required for the Corps to evaluate these minor activities through the individual permit process, and for the public and Federal, Tribal, and state resource agencies to review and comment on the large number of public notices for these activities. In a considerable majority of cases, when the Corps publishes public notices for proposed activities that result in no more than minimal adverse environmental effects, the Corps typically does not receive responses to these public notices from either the public or Federal, Tribal, and state resource agencies. Another important benefit of the NWP program that would not be achieved through the no action alternative is the incentive for project proponents to design their projects so that those activities meet the terms and conditions of an NWP. The Corps believes the NWPs have significantly reduced adverse effects to the aquatic environment because most applicants modify their projects to comply with the NWPs and avoid the delays and costs typically associated with the individual permit process.

In the absence of this NWP, Department of the Army (DA) authorization in the form of another general permit (i.e., regional or programmatic general permits, where available) or individual permits would be required. Corps district offices may develop regional general permits if an NWP is not available, but this is an impractical and inefficient method for activities with no more than minimal individual and cumulative adverse environmental effects that are conducted across the Nation. Not all districts would develop these regional general permits for a variety of reasons. The regulated public, especially those companies that conduct activities in more than one Corps district, would be adversely affected by the widespread use of regional general permits because of the greater potential for lack of consistency and predictability in the authorization of similar activities with no more than minimal individual and cumulative adverse environmental effects. These companies would incur greater costs in their efforts to comply with different regional general permit requirements between Corps districts. Nevertheless, in some states Corps districts have issued programmatic general permits to take the place of this and other NWPs. However, this approach only works in states with regulatory programs comparable to the Corps Regulatory Program.

2.2 National Modification Alternatives

Since the Corps Nationwide Permit program began in 1977, the Corps has continuously strived to develop NWPs that only authorize activities that result in no more than minimal individual and cumulative adverse environmental effects. Every five years the Corps reevaluates the NWPs during the reissuance process, and may modify an NWP to address concerns for the aquatic environment. Utilizing collected data and institutional knowledge concerning activities authorized by the Corps regulatory program, the Corps reevaluates the potential impacts of activities authorized by NWPs. The Corps also uses substantive public comments on proposed NWPs to assess the expected impacts. This NWP was developed to authorize structures and work in navigable waters of the United States, and discharges of dredged or fill material into waters of the United States, for commercial shellfish aquaculture activities, provided those activities have no more than minimal individual and

cumulative adverse environmental effects. The Corps has considered suggested changes to the terms and conditions of this NWP, as well as modifying or adding NWP general conditions, as discussed in the preamble of the Federal Register notice announcing the reissuance of this NWP.

In the June 1, 2016, Federal Register notice, the Corps requested comments on the proposed reissuance of this NWP. The Corps proposed to modify this NWP to clarify that it authorizes new and continuing commercial shellfish aquaculture operations in authorized project areas, and define the project area as the area in which the operator is authorized to conduct commercial shellfish aquaculture activities during the period the NWP is in effect. Project areas can be identified through leases or permits issued by an appropriate state or local government agency, a treaty, or any other easement, lease, deed, contract, or other legally-binding agreement which establishes an enforceable property interest for an operator. The Corps also proposed to define a “new commercial shellfish aquaculture operation” as an operation in a project area where commercial shellfish aquaculture activities have not been conducted during the past 100 years. The Corps also proposed to modify the pre-construction notification requirements for this NWP by removing the PCN requirement for dredge harvesting, tilling, or harrowing conducted in areas inhabited by submerged aquatic vegetation. The Corps proposed to remove the notification requirement for changing from bottom culture to floating or suspended culture, because general condition 1 provides sufficient assurance that these activities will have no more than minimal adverse effects on navigation. Pre-construction notifications will also be required for commercial shellfish aquaculture activities proposed for areas that have not been used for those activities for the past 100 years.

2.3 Regional Modification Alternatives

An important aspect for the NWPs is the emphasis on regional conditions to address differences in aquatic resource functions, services, and values across the nation. All Corps divisions and districts are expected to add regional conditions to the NWPs to enhance protection of the aquatic environment and address local concerns. Division engineers can also revoke an NWP if the use of that NWP results in more than minimal individual and cumulative adverse environmental effects, especially in high value or rare wetlands and other waters. When an NWP is issued or reissued by the Corps, division engineers issue supplemental decision documents that evaluate potential impacts of the NWP at a regional level, and include regional cumulative effects assessments.

Corps divisions and districts also monitor and analyze the cumulative adverse effects of the NWPs, and if warranted, further restrict or prohibit the use of the NWPs to ensure that the NWPs do not authorize activities that result in more than minimal individual and cumulative adverse environmental effects. To the extent practicable, division and district engineers will use regulatory automated information systems and institutional knowledge about the typical adverse effects of activities authorized by NWPs, as well as substantive public comments, to assess the individual and cumulative adverse effects on the aquatic environment resulting from regulated activities.

2.4 Case-specific On-site Alternatives

Although the terms and conditions for this NWP have been established at the national level to authorize most activities that have no more than minimal individual and cumulative adverse environmental effects, division and district engineers have the authority to impose case-specific special conditions on an NWP authorization to ensure that the authorized activities will result in only minimal individual and cumulative adverse environmental effects.

General condition 23 requires the permittee to minimize and avoid impacts to waters of the United States to the maximum extent practicable on the project site. Off-site alternatives cannot be considered for activities authorized by NWPs. During the evaluation of a pre-construction notification, the district engineer may determine that additional avoidance and minimization is practicable. The district engineer may also condition the NWP authorization to require mitigation to reduce impacts to waters of the United States and ensure that the net adverse environmental effects on the aquatic environment are no more than minimal. As another example, the NWP authorization can be conditioned to prohibit the permittee from conducting the activities during certain times of the year to protect specific resources. If the proposed activity will result in more than minimal adverse environmental effects, then the district engineer will exercise discretionary authority and require an individual permit. Discretionary authority can be asserted where there are concerns for the aquatic environment, including high value aquatic habitats. The individual permit review process requires a project-specific alternatives analysis, including the consideration of off-site alternatives, and a public interest review.

3.0 Affected Environment

This environmental assessment is national in scope because the NWP may be used across the country, unless the NWP is revoked or suspended by a division or district engineer under the procedures in 33 CFR 330.5(c) and (d), respectively. The affected environment consists of terrestrial and aquatic ecosystems in the United States, as they have been directly and indirectly affected by past and present federal, non-federal, and private activities. The past and present activities include activities authorized by the various NWPs issued from 1977 to 2012, activities authorized by other types of Department of the Army (DA) permits, as well as other federal, tribal, state, and private activities that are not regulated by the Corps. Aquatic ecosystems are also influenced by past and present activities in uplands, because those land use/land cover changes in uplands and other activities in uplands have indirect effects on aquatic ecosystems (e.g., MEA 2005b, Reid 1993). Due to the large geographic scale of the affected environment (i.e., the entire United States), as well as the many past and present human activities that have shaped the affected environment, it is only practical to describe the affected environment in general terms. In addition, it is not possible to describe the environmental conditions for specific sites where the NWPs may be used to authorize eligible activities.

The total land area in the United States is approximately 2,264,000,000 acres, and the total land area in the contiguous United States is approximately 1,894,000,000 acres (Nickerson et al. 2011). Land uses in 48 states of the contiguous United States as of 2007 is provided in Table 3.1 (Nickerson et al. 2011). Of the land area in the entire United States, approximately 60 percent (1,350,000,000 acres) is privately owned (Nickerson et al. 2011). In the contiguous United States, approximately 67 percent of the land is privately owned, 31 percent is held by the United States government, and two percent is owned by state or local governments (Dale et al. 2000). Developed non-federal lands comprise 4.4 percent of the total land area of the contiguous United States (Dale et al. 2000).

Table 3.1. Major land uses in the United States (Nickerson et al. 2011).

Land Use	Acres	Percent of Total
Agriculture	1,161,000,000	51.3
Forest land	544,000,000	24.0
Transportation use	27,000,000	1.2
Recreation and wildlife areas	252,000,000	11.1
National defense areas	23,000,000	1.0
Urban land	61,000,000	2.7
Miscellaneous use	197,000,000	8.7
Total land area	2,264,000,000	100.0

3.1 Quantity of Aquatic Ecosystems in the United States

There are approximately 283.1 million acres of wetlands in the United States; 107.7 million acres are in the conterminous United States and the remaining 175.4 million acres are in Alaska (Mitsch and Hernandez 2013). Wetlands occupy less than 9 percent of the global land area (Zedler and Kercher 2005). According to Dahl (2011), wetlands and deepwater habitats cover approximately 8 percent of the land area in the conterminous United States. Rivers and streams comprise approximately 0.52 percent of the total land area of the continental United States (Butman and Raymond 2011). Therefore, the wetlands, streams, rivers, and other aquatic habitats that are potentially waters of the United States and subject to regulation by the Corps under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899 comprise a minor proportion of the land area of the United States. The remaining land area of the United States (more than 92 percent, depending on the proportion of wetlands, streams, rivers, and other aquatic habitats that are subject to regulation under those two statutes) is outside the Corps regulatory authority.

Dahl (1990) estimated that approximately 53 percent of the wetlands in the conterminous United States were lost in the 200-year period from the 1780s to 1980s, while Alaska lost less than one percent of its wetlands and Hawaii lost approximately 12 percent of its original wetland acreage. In the 1780s, there were approximately 221 million acres of wetlands in the conterminous United States (Dahl 1990). California lost the largest percentage of its

wetlands (91 percent), whereas Florida lost the largest acreage (9.3 million acres) (Dahl 1990). During that 200-year period, 22 states lost more than 50 percent of their wetland acreage, and 10 states have lost more than 70 percent of their original wetland acreage (Dahl 1990).

Frayer et al. (1983) evaluated wetland status and trends in the United States during the period of the mid-1950s to the mid-1970s. During that 20-year period, approximately 7.9 million acres of wetlands (4.2 percent) were lost in the conterminous United States. Much of the loss of estuarine emergent wetlands was due to changes to estuarine subtidal deepwater habitat, and some loss of estuarine emergent wetlands was due to urban development. For palustrine vegetated wetlands, nearly all of the losses of those wetlands were due to agricultural activities (e.g., conversion to agricultural production).

The U.S. Fish and Wildlife Service also examined the status and trends of wetlands in the United States during the period of the mid-1970s to the 1980s, and found that there was a net loss of more than 2.6 million acres of wetlands (2.5 percent) during that time period (Dahl and Johnson 1991). Freshwater wetlands comprised 98 percent of those wetland losses (Dahl and Johnson 1991). During that time period, losses of estuarine wetlands were estimated to be 71,000 acres, with most of that loss due to changes of emergent estuarine wetlands to open waters caused by shifting sediments (Dahl and Johnson 1991). Conversions of wetlands to agricultural use were responsible for 54 percent of the wetland losses, and conversion to other land uses resulted in the loss of 41 percent of wetlands (Dahl and Johnson 1991). Urban development was responsible for five percent of the wetland loss (Dahl and Johnson 1991). The annual rate of wetland loss has decreased substantially since the 1970s (Dahl 2011), when wetland regulation became more prevalent (Brinson and Malvárez 2002).

Between 2004 and 2009, there was no statistically significant difference in wetland acreage in the conterminous United States (Dahl 2011). According to the 2011 wetland status and trends report, during the period of 2004 to 2009 urban development accounted for 11 percent of wetland losses (61,630 acres), rural development resulted in 12 percent of wetland losses (66,940 acres), silviculture accounted for 56 percent of wetland losses (307,340 acres), and wetland conversion to deepwater habitats caused 21 percent of the loss in wetland area (115,960 acres) (Dahl 2011). Some of the losses occurred to wetlands that are not subject to Clean Water Act jurisdiction and some losses are due to activities not regulated under Section 404 of the Clean Water Act, such as unregulated drainage activities, exempt forestry activities, or water withdrawals. From 2004 to 2009, approximately 100,020 acres of wetlands were gained as a result of wetland restoration and conservation programs on agricultural land (Dahl 2011). Another source of wetland gain is conversion of other uplands to wetlands, resulting in a gain of 389,600 acres during the period of 2004 to 2009 (Dahl 2011). Inventories of wetlands, streams, and other aquatic resources are incomplete because the techniques used for those studies cannot identify some of those resources (e.g., Dahl (2011) for wetlands; Meyer and Wallace (2001) for streams).

Losses of vegetated estuarine wetlands due to the direct effects of human activities have decreased significantly due to the requirements of Section 404 of the Clean Water Act and

other laws and regulations (Dahl 2011). During the period of 2004 to 2009, less than one percent of estuarine emergent wetlands were lost as a direct result of human activities, while other factors such as sea level rise, land subsidence, storm events, erosion, and other ocean processes caused substantial losses of estuarine wetlands (Dahl 2011). The indirect effects of other human activities, such as oil and gas development, water extraction, development of the upper portions of watersheds, and levees, have also resulted in coastal wetland losses (Dahl 2011). Eutrophication of coastal waters can also cause losses of emergent estuarine wetlands, through changes in growth patterns of marsh plants and decreases in the stability of the wetland substrate, which changes those marshes to mud flats (Deegan et al. 2012).

The Emergency Wetlands Resources Act of 1986 (Public Law 99-645) requires the USFWS to submit wetland status and trends reports to Congress (Dahl 2011). The latest status and trends report, which covers the period of 2004 to 2009, is summarized in Table 3.2. The USFWS status and trends report only provides information on acreage of the various aquatic habitat categories and does not assess the quality or condition of those aquatic habitats (Dahl 2011).

Table 3.2. Estimated aquatic resource acreages in the conterminous United States in 2009 (Dahl 2011).

Aquatic Habitat Category	Estimated Area in 2009 (acres)
Marine intertidal	227,800
Estuarine intertidal non-vegetated	1,017,700
Estuarine intertidal vegetated	4,539,700
All intertidal waters and wetlands	5,785,200
Freshwater ponds	6,709,300
Freshwater vegetated	97,565,300
• Freshwater emergent wetlands	27,430,500
• Freshwater shrub wetlands	18,511,500
• Freshwater forested wetlands	51,623,300
All freshwater wetlands	104,274,600
Lacustrine deepwater habitats	16,859,600
Riverine deepwater habitats	7,510,500
Estuarine subtidal habitats	18,776,500
All wetlands and deepwater habitats	153,206,400

The acreage of lacustrine deepwater habitats does not include the open waters of Great Lakes (Dahl 2011).

The Federal Geographic Data Committee has established the Cowardin system developed by the U.S. Fish and Wildlife Service (USFWS) (Cowardin et al. 1979) as the national standard for wetland mapping, monitoring, and data reporting (Dahl 2011) (see Federal Geographic

Data Committee (2013)). The Cowardin system is a hierarchical system which describes various wetland and deepwater habitats, using structural characteristics such as vegetation, substrate, and water regime as defining characteristics. Wetlands are defined by plant communities, soils, or inundation or flooding frequency. Deepwater habitats are permanently flooded areas located below the wetland boundary. In rivers and lakes, deepwater habitats are usually more than two meters deep. The Cowardin et al. (1979) definition of “wetland” differs from the definition used by the Corps and U.S. EPA for the purposes of implementing Section 404 of the Clean Water Act. The Corps-U.S. EPA regulations defines wetlands as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.” [33 CFR 328.3(c)(4); 40 CFR 230.3(o)(3)(iv)] The Cowardin et al. (1979) requires only one factor (i.e., wetland vegetation, soils, hydrology) to be present for an area to be a wetland, while the Corps-U.S. EPA wetland definition requires all three factors to be present under normal circumstances (Tiner 1997b, Mitsch and Gosselink 2015). The NWI produced by applying the Cowardin et al. (1979) definition is the only national scale wetland inventory available. There is no national inventory of wetland acreage based on the Corps-U.S. EPA wetland definition at 33 CFR 328.3(c)(4).

There are five major systems in the Cowardin classification scheme: marine, estuarine, riverine, lacustrine, and palustrine (Cowardin et al. 1979). The marine system consists of open ocean on the continental shelf and its high energy coastlines. The estuarine system consists of tidal deepwater habitats and adjacent tidal wetlands that are usually partially enclosed by land, but may have open connections to open ocean waters. The riverine system generally consists of all wetland and deepwater habitats located within a river channel. The lacustrine system generally consists of wetland and deepwater habitats located within a topographic depression or dammed river channel, with a total area greater than 20 acres. The palustrine system generally includes all non-tidal wetlands and wetlands located in tidal areas with salinities less than 0.5 parts per thousand; it also includes ponds less than 20 acres in size. Approximately 95 percent of wetlands in the conterminous United States are freshwater wetlands, and the remaining 5 percent are estuarine or marine wetlands (Dahl 2011).

According to Hall et al. (1994), there are more than 204 million acres of wetlands and deepwater habitats in the State of Alaska, including approximately 174.7 million acres of wetlands. Wetlands and deepwater habitats comprise approximately 50.7 percent of the surface area in Alaska (Hall et al. 1994).

The National Resources Inventory (NRI) is a statistical survey conducted by the Natural Resources Conservation Service (NRCS) (USDA 2015) of natural resources on non-federal land in the United States. The NRCS defines non-federal land as privately owned lands, tribal and trust lands, and lands under the control of local and state governments. Acreages of palustrine and estuarine wetlands and the land uses those wetlands are subjected to are summarized in Table 3.3. The 2012 NRI estimates that there are 111,220,800 acres of palustrine and estuarine wetlands on non-Federal land and water areas in the United States

(USDA 2015). The 2012 NRI estimates that there are 49,518,700 acres of open waters on non-Federal land in the United States, including lacustrine, riverine, and marine habitats, as well as estuarine deepwater habitats.

Table 3.3. The 2012 National Resources Inventory acreages for palustrine and estuarine wetlands on non-federal land, by land cover/use category (USDA 2015).

National Resources Inventory Land Cover/Use Category	Area of Palustrine and Estuarine Wetlands (acres)
cropland, pastureland, and Conservation Reserve Program land	17,800,000
forest land	65,800,000
rangeland	8,000,000
other rural land	14,700,000
developed land	1,400,000
water area	3,600,000
Total	111,300,000

The land cover/use categories used by the 2012 NRI are defined below (USDA 2015). Croplands are areas used to produce crops grown for harvest. Pastureland is land managed for livestock grazing, through the production of introduced forage plants. Conservation Reserve Program land is under a Conservation Reserve Program contract. Forest land is comprised of at least 10 percent single stem woody plant species that will be at least 13 feet tall at maturity. Rangeland is land on which plant cover consists mostly of native grasses, herbaceous plants, or shrubs suitable for grazing or browsing, and introduced forage plant species. Other rural land consists of farmsteads and other farm structures, field windbreaks, marshland, and barren land. Developed land is comprised of large urban and built-up areas (i.e., urban and built-up areas 10 acres or more in size), small built-up areas (i.e., developed lands 0.25 to 10 acres in size), and rural transportation land (e.g., roads, railroads, and associated rights-of-way outside urban and built-up areas). Water areas are comprised of waterbodies and streams that are permanent open waters.

The wetlands data from the Fish and Wildlife Service’s Status and Trends study and the Natural Resources Conservation Service’s National Resources Inventory should not be compared, because they use different methods and analyses to produce their results (Dahl 2011).

Leopold, Wolman, and Miller (1964) estimated that there are approximately 3,250,000 miles of river and stream channels in the United States. This estimate is based on an analysis of 1:24,000 scale topographic maps. Their estimate does not include many small streams. Many small streams, especially headwater streams, are not mapped on 1:24,000 scale U.S. Geological Survey (USGS) topographic maps (Leopold 1994) or included in other

inventories (Meyer and Wallace 2001), including the National Hydrography Dataset (Elmore et al. 2013). Many small streams and rivers are not identified through maps produced by aerial photography or satellite imagery because of inadequate image resolution or trees or other vegetation obscuring the visibility of those streams from above (Benstead and Leigh 2012). In a study of stream mapping in the southeastern United States, only 20 percent of the stream network was mapped on 1:24,000 scale topographic maps, and nearly none of the observed intermittent or ephemeral streams were indicated on those maps (Hansen 2001). Another study in Massachusetts showed that those types of topographic maps exclude over 27 percent of stream miles in a watershed (Brooks and Colburn 2011). For a 1:24,000 scale topographic map, the smallest tributary found by using 10-foot contour interval has a drainage area of 0.7 square mile and length of 1,500 feet, and smaller stream channels are common throughout the United States (Leopold 1994). Benstead and Leigh (2012) found that the density of stream channels (length of stream channels per unit area) identified by digital elevation models was three times greater than the drainage density calculated by using USGS maps. Elmore et al. (2013) made similar findings in watersheds in the mid-Atlantic, where they determined that the stream density was 2.5 times greater than the stream density calculated with the National Hydrography Dataset. Due to the difficulty in mapping small streams, there are no accurate estimates of the total number of river or stream miles in the conterminous United States that might be considered as “waters of the United States.”

The quantity of the Nation’s aquatic resources presented by studies that estimate the length or number of stream channels (see above) or the acreage of wetlands (USFWS status and trends studies, National Wetland Inventory (NWI), and Natural Resources Inventory (NRI) are underestimates, because those inventories do not include many small wetlands and streams. The USFWS status and trends study does not include Alaska, Hawaii, or the territories. The underestimate of national wetland acreage by the USFWS status and trends study and the NWI is primarily the result of the minimum size of wetlands detected through remote sensing techniques and the difficulty of identifying certain wetland types through those remote sensing techniques. The remote sensing approaches used by the USFWS for its NWI maps and its status and trends reports result in errors of omission that exclude wetlands that are difficult to identify through photointerpretation (Tiner 1997a). These errors of omission are due to wetland type and the size of target mapping units (Tiner 1997a). Therefore, it is important to understand the limitations of the source data when describing the environmental baseline for wetlands using maps and studies produced by remote sensing, especially in terms of wetland quantity.

Factors affecting the accuracy of wetland maps made by remote sensing include: the degree of difficulty in identifying a wetland, map scale, the quality and scale of the source information (e.g., aerial or satellite photos), the environmental conditions when the source information was obtained, the time of year source information was obtained, the mapping equipment, and the skills of the people producing the maps (Tiner 1999). The map scale usually affects the target mapping unit, which is the minimum wetland size that can be consistently mapped (Tiner 1997b). In general, wetland types that are difficult to identify through field investigations are likely to be underrepresented in maps made by remote sensing (Tiner 1999). Wetlands difficult to identify through remote sensing include forested

wetlands, small wetlands, narrow wetlands, mowed wetlands, farmed wetlands, wetlands with hydrology at the drier end of the wetland hydrology continuum, and significantly drained wetlands (Tiner 1999). In the most recent wetland status and trends report published by the U.S. Fish and Wildlife Service, the target minimum wetland mapping unit was 1 acre, although some easily identified wetlands as small as 0.1 acre were identified in that effort (Dahl 2011). The National Wetland Inventory identifies wetlands regardless of their jurisdictional status under the Clean Water Act (Tiner 1997b).

Activities authorized by NWP's will adversely affect a smaller proportion of the Nation's wetland base than indicated by the wetlands acreage estimates provided in the most recent status and trends report, or the NWI maps for a particular region.

Not all wetlands, streams, and other types of aquatic resources are subject to federal jurisdiction under the Clean Water Act (Mitsch and Gosselink 2015). Two U.S. Supreme Court decisions have identified limits to Clean Water Act jurisdiction. In 2001, in *Solid Waste Agency of Northern Cook County v. Army Corps of Engineers* (531 U.S. 159) the U.S. Supreme Court held that the use of isolated, non-navigable, intrastate waters by migratory birds is not, by itself a sufficient basis for exercising federal regulatory authority under the Clean Water Act (see 80 FR 37056). In the Supreme Court's 2006 decision in *Rapanos v. United States*, (547 U.S. 715), one justice stated that waters and wetlands regulated under the Clean Water Act must have a "significant nexus" to downstream traditional navigable waters. Four justices (the plurality) concluded that Clean Water Act jurisdiction applies only to relatively permanent waters connected to traditional navigable waters and to wetlands that have a continuous surface connection to those relatively permanent waters. The remaining justices in *Rapanos* stated that Clean Water Act jurisdiction applies to waters and wetlands that meet either the significant nexus test or the Plurality's test.

There are 94,133 miles of shoreline in the United States (NOAA 1975). Of that shoreline, 88,633 miles are tidal shoreline and 5,500 miles are shoreline along the Great Lakes and rivers that connect those lakes to the Atlantic Ocean. More recently, Gittman et al. (2015) estimated that there are 99,524 miles of tidal shoreline in the conterminous United States.

3.2 Quality of Aquatic Ecosystems in the United States

The USFWS status and trends study does not assess the condition or quality of wetlands and deepwater habitats (Dahl 2011). Information on water quality in waters and wetlands, as well as the causes of water quality impairment, is collected by the U.S. EPA under Sections 305(b) and 303(d) of the Clean Water Act. Table 3.4 provides U.S. EPA's most recent national summary of water quality in the Nation's waters and wetlands.

Table 3.4. National summary of water quality data (U.S. EPA 2015).

Category of water	Total waters	Total waters assessed	Percent of waters assessed	Good waters	Threatened waters	Impaired waters
Rivers and streams	3,533,205 miles	1,046,621 miles	29.6	476,765 miles	7,657 miles	562,198 miles
Lakes, reservoirs and ponds	41,666,049 acres	17,904,395 acres	43.0	5,658,789 acres	145,572 acres	12,100,034 acres
Bays and estuaries	87,791 square miles	33,402 square miles	38.0	7,291 square miles	0 square miles	26,111 square miles
Coastal shoreline	58,618 miles	8,162 miles	13.9	900 miles	0 miles	7,262 miles
Ocean and near coastal waters	54,120 square miles	1,674 square miles	3.1	616 square miles	0 square miles	1,058 square miles
Wetlands	107,700,000 acres	1,112,438 acres	1.0	573,947 acres	0 acres	538,492 acres
Great Lakes shoreline	5,202 miles	4,431 miles	85.2	78 miles	0 miles	4,353 miles
Great Lakes open waters	60,546 square miles	53,332 square miles	88.1	62 square miles	0 square miles	53,270 square miles

Waters and wetlands classified by states as “good” meets all their designated uses. Waters classified as “threatened” currently support all of their designated uses, but if pollution control measures are not taken one or more of those uses may become impaired in the future. A water or wetland is classified by the state as “impaired” if any one of its designated uses is not met. The definitions of good, threatened, and impaired are applied by states to describe the quality of their waters (the above definitions were found in the metadata in U.S. EPA (2015)). Designated uses include the “protection and propagation of fish, shellfish and wildlife,” “recreation in and on the water,” the use of waters for “public water supplies, propagation of fish, shellfish, wildlife, recreation in and on the water,” and “agricultural, industrial and other purposes including navigation.” (40 CFR 130.3). These designated uses are assessed by states in a variety of ways, by examining various physical, chemical and biological characteristics, so it is not possible to use the categories of “good,” “threatened,” and “impaired” to infer the level of ecological functions and services these waters perform.

According to the latest U.S. EPA national summary (U.S. EPA 2015), 54 percent of assessed rivers and streams, 68 percent of assessed lakes, reservoirs, and ponds, 78 percent of assessed bays and estuaries, 89 percent of assessed coastal shoreline, 63 percent of assessed ocean and near coastal waters, and 48 percent of assessed wetlands are impaired.

For rivers and streams, 34 causes of impairment were identified, and the top 10 causes were pathogens, sediment, nutrients, mercury, organic enrichment/oxygen depletion, polychlorinated biphenyls, metals (other than mercury), temperature, habitat alterations, and

flow alteration(s). The primary sources of impairment for the assessed rivers and streams were agriculture, unknown sources, atmospheric deposition, urban-related runoff/stormwater, hydromodification, municipal discharges/sewage, natural/wildlife, unspecified point source, habitat alterations not directly related to hydromodification, and resource extraction.

Thirty-one causes of impairment were identified for bays and estuaries. The top 10 causes of impairment for these waters is: mercury, polychlorinated biphenyls, pathogens, organic enrichment/oxygen depletion, dioxins, other causes, fish consumption advisories, metals (other than mercury), noxious aquatic plants, and pesticides. For bays and estuaries, the top 10 sources of impairment were atmospheric deposition, unknown sources, municipal discharges/sewage, other sources, industrial, natural/wildlife, urban-related runoff/stormwater, spills/dumping, unspecified non-point sources, and agriculture.

Coastal shorelines were impaired by 15 identified causes, the top 10 of which were: mercury, pathogens, organic enrichment/oxygen depletion, turbidity, pH/acidity/caustic conditions, nutrients, temperature, oil and grease, algal growth, and causes unknown/impaired biota. The top 10 sources of impairment of coastal shorelines are “unknown,” atmospheric deposition, municipal discharges/sewage, urban-related runoff/stormwater, hydromodification, unspecified non-point sources, agriculture, recreational boating and marinas, industrial, and spills/dumping.

For wetlands, 26 causes of impairment were identified, and the top 10 causes were organic enrichment/oxygen depletion, mercury, pathogens, metals (excluding mercury), toxic inorganics, temperature, sediment, algal growth, flow alterations, and turbidity. The primary sources for wetland impairment were “unknown,” agriculture, atmospheric deposition, industrial, municipal discharges/sewage, recreational boating and marinas, resource extraction, natural/wildlife, hydromodification, and unspecified point sources.

Water quality standards are established by states, with review and approval by the U.S. EPA (see Section 303(c) of the Clean Water Act and the implementing regulations at 40 CFR part 131). Under Section 401 of the Clean Water Act States review proposed discharges to determine compliance with applicable water quality standards.

Most causes and sources of impairment are not due to activities regulated under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899. Inputs of sediments into aquatic ecosystems can result from erosion occurring within a watershed (Beechie et al. 2013, Gosselink and Lee 1989). As water moves through a watershed it carries sediments and pollutants to streams (e.g., Allan 2004, Dudgeon et al. 2005, Paul and Meyer 2001) and wetlands (e.g., Zedler and Kercher 2005, Wright et al. 2006). Non-point sources of pollution (i.e., pollutants carried in runoff from farms, roads, and urban areas) are largely uncontrolled (Brown and Froemke 2012) because the Clean Water Act only requires permits for point sources discharges of pollutants (i.e., discharges of dredged or fill material regulated under section 404 and point source discharges of other pollutants regulated under section 402).

The indirect effects of changes in upland land use (which are highly likely not to be subject to federal control and responsibility, at least in terms of the Corps Regulatory Program), including the construction and expansion of upland developments, have substantial adverse effects on the quality (i.e. the ability to perform hydrologic, biogeochemical, and habitat functions) of jurisdictional waters and wetlands because those upland activities alter watershed-scale processes. Those watershed-scale processes include water movement and storage, erosion and sediment transport, and the transport of nutrients and other pollutants.

Habitat alterations as a cause or source of impairment may be the result of activities regulated under section 404 and section 10 because they involve discharges of dredged or fill material into jurisdictional waters or structures or work in navigable waters, but habitat alterations may also occur as a result of activities not regulated under those two statutes, such as the removal of vegetation from upland riparian areas. Hydrologic modifications may or may not be regulated under section 404 or section 10, depending on whether those hydrologic modifications are the result of discharges of dredged or fill material into waters of the United States regulated under Section 404 of the Clean Water Act or structures or work in navigable waters of the United States regulated under Section 10 of the Rivers and Harbors Act of 1899. When states, tribes, or the U.S. EPA establish total daily maximum loads (TMDLs) for pollutants and other impairments for specific waters, there may be variations in how these TMDLs are defined (see 40 CFR part 130).

As discussed below, many anthropogenic activities and natural processes affect the ability of jurisdictional waters and wetlands to perform ecological functions. Stream and river functions are affected by activities occurring in their watersheds, including the indirect effects of land uses changes (Beechie et al. 2013, Allan 2004, Paul and Meyer 2001). Booth et al. (2004) found riparian land use in residential areas also strongly affects stream condition because many landowners clear vegetation up to the edge of the stream bank. The removal of vegetation from upland riparian areas and other activities in those non-jurisdictional areas do not require DA authorization. Wetland functions are also affected by indirect effects of land use activities in the land area that drains to the wetland (Zedler and Kercher 2005, Wright et al. 2006). Human activities within a watershed or catchment that have direct or indirect adverse effects on rivers, streams, wetlands, and other aquatic ecosystems are not limited to discharges of dredged or fill material into waters of the United States or structures or work in a navigable waters. Human activities in uplands have substantial indirect effects on the structure and function of aquatic ecosystems, including streams and wetlands, and their ability to sustain populations of listed species. It is extremely difficult to distinguish between degradation of water quality caused by upland activities and degradation of water quality caused by the filling or alteration of wetlands (Gosselink and Lee 1989).

Most causes and sources of impairment are not due to activities regulated under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899. Habitat alterations as a cause or source of impairment may be the result of activities regulated under section 404 and section 10 because they involve discharges of dredged or fill material or structures or work in navigable waters, but habitat alterations may also occur as a result of activities not regulated under those two statutes, such as the removal of vegetation from

upland riparian areas. Hydrologic modifications may or may not be regulated under section 404 or section 10.

The U.S. Environmental Protection Agency (U.S. EPA) has undertaken the National Wetland Condition Assessment (NWCA), which is a statistical survey of wetland condition in the United States (U.S. EPA 2016). The NWCA assesses the ambient conditions of wetlands at the national and regional scales. The national scale encompasses the conterminous United States. The regional scale consists of four aggregated ecoregions: Coastal Plains, Eastern Mountains and Upper Midwest, Interior Plains, and West. In May 2016, U.S. EPA issued a final report on the results of its 2011 NWCA (U.S. EPA 2016).

The 2011 NWCA determined that, across the conterminous United States, 48 percent of wetland area (39.8 million acres) is in good condition, 20 percent of the wetland area (12.4 million acres) is in fair condition, and 32 percent (19.9 million acres) is in poor condition (U.S. EPA 2016). The 2011 NWCA also examined indicators of stress for the wetlands that were evaluated. The most prevalent physical stressors were vegetation removal, surface hardening via conversion to pavement or soil compaction, and ditching (U.S. EPA 2016). In terms of chemical stressors, most wetlands were subject to low exposure to heavy metals and soil phosphorous, but substantial percentages of wetland area in the West and Eastern Mountains and Upper Midwest ecoregions were found to have moderate stressor levels for heavy metals (U.S. EPA 2016). For soil phosphorous concentrations, stressor levels were high for 13 percent of the wetland area in the Eastern Mountains and Upper Midwest ecoregion (U.S. EPA 2016). Across the conterminous United States, for biological stressors indicated by non-native plants, 61 percent of the wetland area exhibited low stressor levels (U.S. EPA 2016). When examined on an ecoregion basis, the Eastern Mountains and Upper Midwest and Coastal Plains ecoregions had high percentages of wetland area with low non-native plant stressor levels, but the West and Interior Plains ecoregions had small percentages of areas with low non-native plant stressor levels (U.S. EPA 2016).

3.3 Aquatic resource functions and services

Functions are the physical, chemical, and biological processes that occur in ecosystems (33 CFR 332.2). Wetland functions occur through interactions of their physical, chemical, and biological features (Smith et al. 1995). Wetland functions depend on a number of factors, such as the movement of water through the wetland, landscape position, surrounding land uses, vegetation density within the wetland, geology, soils, water source, and wetland size (NRC 1995). In its evaluation of wetland compensatory mitigation in the Clean Water Act Section 404 permit program, the National Research Council (2001) recognized five general categories of wetland functions:

- Hydrologic functions
- Water quality improvement
- Vegetation support
- Habitat support for animals
- Soil functions

Hydrologic functions include short- and long-term water storage and the maintenance of wetland hydrology (NRC 1995). Water quality improvement functions encompass the transformation or cycling of nutrients, the retention, transformation, or removal of pollutants, and the retention of sediments (NRC 1995). Vegetation support functions include the maintenance of plant communities, which support various species of animals as well as economically important plants. Wetland soils support diverse communities of bacteria and fungi which are critical for biogeochemical processes, including nutrient cycling and pollutant removal and transformation (NRC 2001). Wetland soils also provide rooting media for plants, as well as nutrients and water for those plants. These various functions generally interact with each other, to influence overall wetland functioning, or ecological integrity (Smith et al. 1995; Fennessy et al. 2007). As discussed earlier in this report, the Corps regulations at 33 CFR 320.4(b) list wetland functions that are important for the public interest review during evaluations of applications for DA permits, and for the issuance of general permits.

Not all wetlands perform the same functions, nor do they provide functions to the same degree (Smith et al. 1995). Therefore, it is necessary to account for individual and regional variation when evaluating wetlands and the functions and services they provide. The types and levels of functions performed by a wetland are dependent on its hydrologic regime, the plant species inhabiting the wetland, soil type, and the surrounding landscape, including the degree of human disturbance of the landscape (Smith et al. 1995).

Streams also provide a variety of functions, which differ from wetland functions. Streams also provide hydrologic functions, nutrient cycling functions, food web support, and corridors for movement of aquatic organisms (Allan and Castillo 2007). When considering stream functions, the stream channel should not be examined in isolation. The riparian corridor next to the stream channel is an integral part of the stream ecosystem and has critical roles in stream functions (NRC 2002). Riparian areas provide many of the same general functions as wetlands (NRC 1995, 2002). Fischenich (2006) conducted a review of stream and riparian corridor functions, and through a committee, identified five broad categories of stream functions:

- Stream system dynamics
- Hydrologic balance
- Sediment processes and character
- Biological support
- Chemical processes and landscape pathways

Stream system dynamics refers to the processes that affect the development and maintenance of the stream channel and riparian area over time, as well as energy management by the stream and riparian area. Hydrologic balance includes surface water storage processes, the exchange of surface and subsurface water, and the movement of water through the stream corridor. Sediment processes and character functions relate to processes for establishing and maintaining stream substrate and structure. Biological support functions include the biological communities inhabiting streams and their riparian areas. Chemical processes and pathway functions influence water and soil quality, as well as the chemical processes and nutrient cycles that occur in streams and their riparian areas. Rivers

and streams function perform functions to different degrees, depending on watershed condition, the severity of direct and indirect impacts to streams caused by human activities, and their interactions with other environmental components, such as their riparian areas (Allan 2004, Gergel et al. 2002).

Ecosystem services are the benefits that humans derive from ecosystem functions (33 CFR 332.2). The Millennium Ecosystem Assessment (2005b) describes four categories of ecosystem services: provisioning services, regulating services, cultural services, and supporting services. For wetlands and open waters, provisioning services include the production of food (e.g., fish, fruits, game), fresh water storage, food and fiber production, production of chemicals that can be used for medicine and other purposes, and supporting genetic diversity for resistance to disease. Regulating services relating to open waters and wetlands consist of climate regulation, control of hydrologic flows, water quality through the removal, retention, and recovery of nutrients and pollutants, erosion control, mitigating natural hazards such as floods, and providing habitat for pollinators. Cultural services that come from wetlands and open waters include spiritual and religious values, recreational opportunities, aesthetics, and education. Wetlands and open waters contribute supporting services such as soil formation, sediment retention, and nutrient cycling.

Examples of services provided by wetland functions include flood damage reduction, maintenance of populations of economically important fish and wildlife species, maintenance of water quality (NRC 1995, MEA 2005b) and the production of populations of wetland plant species that are economically important commodities, such as timber, fiber, and fuel (MEA 2005b). Wetlands can also provide important climate regulation and storm protection services (MEA 2005b).

Stream functions also result in ecosystem services that benefit society. Streams and their riparian areas store water, which can reduce downstream flooding and subsequent flood damage (NRC 2002, MEA 2005b). These ecosystems also maintain populations of economically important fish, wildlife, and plant species, including valuable fisheries (MEA 2005b, NRC 2002). The nutrient cycling and pollutant removal functions help maintain or improve water quality for surface waters (NRC 2002, MEA 2005b). Streams and riparian areas also provide important recreational opportunities. Rivers and streams also provide water for agricultural, industrial, and residential use (MEA 2005b).

Freshwater ecosystems provide services such as water for drinking, household uses, manufacturing, thermoelectric power generation, irrigation, and aquaculture; production of finfish, waterfowl, and shellfish; and non-extractive services, such as flood control, transportation, recreation (e.g., swimming and boating), pollution dilution, hydroelectric generation, wildlife habitat, soil fertilization, and enhancement of property values (Postel and Carpenter 1997).

Marine ecosystems provide a number of ecosystem services, including fish production; materials cycling (e.g., nitrogen, carbon, oxygen, phosphorous, and sulfur); transformation, detoxification, and sequestration of pollutants and wastes produced by humans; support of ocean-based recreation, tourism, and retirement industries; and coastal land development

and valuation, including aesthetics related to living near the ocean (Peterson and Lubchenco 1997).

This NWP authorizes activities in waters of the United States, including navigable waters. The waters in which this NWP would normally be used are the estuarine and marine systems of the Cowardin classification system.

Activities authorized by this NWP will provide a wide variety of goods and services that are valued by society. For example, commercial shellfish aquaculture activities provide sources of protein and other nutrients to human populations. Commercial shellfish aquaculture activities can also produce other compounds that are used by society.

4.0 Environmental Consequences

4.1 General Evaluation Criteria

This document contains a general assessment of the foreseeable effects of the individual activities authorized by this NWP and the anticipated cumulative effects of those activities. In the assessment of these individual and cumulative effects, the terms and limits of the NWP, notification requirements, and the standard NWP general conditions are considered. The supplemental documentation provided by division engineers will address how regional conditions affect the individual and cumulative effects of the NWP.

The following evaluation comprises the NEPA analysis, the public interest review specified in 33 CFR 320.4(a)(1) and (2), and the impact analysis specified in Subparts C through F of the 404(b)(1) Guidelines (40 CFR Part 230).

The issuance of an NWP is based on a general assessment of the effects on public interest and environmental factors that are likely to occur as a result of using this NWP to authorize activities in waters of the United States. As such, this assessment must be speculative or predictive in general terms. Since NWPs authorize activities across the nation, projects eligible for NWP authorization may be constructed in a wide variety of environmental settings. Therefore, it is difficult to predict all of the indirect impacts that may be associated with each activity authorized by an NWP. For example, the NWP that authorizes 25 cubic yard discharges of dredged or fill material into waters of the United States may be used to fulfill a variety of project purposes, and the indirect effects will vary depending on the specific activity and the environmental characteristics of the site in which the activity takes place. Indication that a factor is not relevant to a particular NWP does not necessarily mean that the NWP would never have an effect on that factor, but that it is a factor not readily identified with the authorized activity. Factors may be relevant, but the adverse effects on the aquatic environment are negligible, such as the impacts of a boat ramp on water level fluctuations or flood hazards. Only the reasonably foreseeable direct, indirect, and cumulative effects are included in the environmental assessment for this NWP. Division and district engineers will impose, as necessary, additional conditions on the NWP

authorization or exercise discretionary authority to address locally important factors or to ensure that the authorized activity results in no more than minimal individual and cumulative adverse environmental effects. In any case, adverse effects will be controlled by the terms, conditions, and additional provisions of the NWP. For example, Section 7 Endangered Species Act consultation will be required for all activities that may affect endangered or threatened species or critical habitat (see 33 CFR 330.4(f) and NWP general condition 18).

4.2 Impact Analysis

This NWP authorizes structures, work, and discharges of dredged or fill material into navigable waters of the United States for commercial shellfish aquaculture activities.

For activities authorized by this NWP, pre-construction notification is required if: (1) the activity will include a species that has never been cultivated in the waterbody; or (2) the activity occurs in an area that has not been used for commercial shellfish aquaculture activities during the past 100 years. The pre-construction notification requirement allows district engineers to review proposed activities on a case-by-case basis to ensure that the individual and cumulative adverse environmental effects of those activities are no more than minimal. If the district engineer determines that the adverse environmental effects of a particular project are more than minimal after considering mitigation, then discretionary authority will be asserted and the applicant will be notified that another form of DA authorization, such as a regional general permit or individual permit, is required (see 33 CFR 330.4(e) and 330.5).

When making minimal adverse environmental effects determinations the district engineer will consider the direct and indirect effects caused by the NWP activity. The district engineer will also consider site specific factors, such as the environmental setting in the vicinity of the NWP activity, the type(s) of resource(s) that will be affected by the NWP activity, the functions provided by the aquatic resources that will be affected by the NWP activity, the degree or magnitude to which the aquatic resources perform those functions, the extent that aquatic resource functions will be lost as a result of the NWP activity (e.g., partial or complete loss), the duration of the adverse effects (temporary or permanent), the importance of the aquatic resource functions to the region (e.g., watershed or ecoregion), and mitigation required by the district engineer. These criteria are listed in the NWPs in Section D, "District Engineer's Decision." If an appropriate functional or condition assessment method is available and practicable to use, that assessment method may be used by the district engineer to assist in the minimal adverse effects determination. The district engineer may add case-specific special conditions to the NWP authorization to address site-specific environmental concerns.

Additional conditions can be placed on proposed activities on a regional or case-by-case basis to ensure that the activities have no more than minimal individual and cumulative adverse environmental effects. Regional conditioning of this NWP will be used to account for differences in aquatic resource functions, services, and values across the country, ensure that the NWP authorizes only those activities with no more than minimal individual and

cumulative adverse environmental effects, and allow each Corps district to prioritize its workload based on where its efforts will best serve to protect the aquatic environment. Regional conditions can prohibit the use of an NWP in certain waters (e.g., high value waters or specific types of wetlands or waters), lower pre-construction notification thresholds, or require pre-construction notification for some or all NWP activities in certain watersheds or types of waters. Specific NWPs can also be revoked on a geographic or watershed basis where the individual and cumulative adverse environmental effects resulting from the use of those NWPs are more than minimal.

In high value waters, division and district engineers can: 1) prohibit the use of the NWP in those waters and require an individual permit or regional general permit; 2) impose an acreage limit on the NWP; 3) lower the notification threshold of the NWP to require pre-construction notification for activities with smaller impacts in those waters; 4) require pre-construction notification for some or all NWP activities in those waters; 5) add regional conditions to the NWP to ensure that the individual and cumulative adverse environmental effects are no more than minimal; or 6) for those activities that require pre-construction notification, add special conditions to NWP authorizations, such as compensatory mitigation requirements, to ensure that the adverse environmental effects are only minimal. NWPs can authorize activities in high value waters as long as the individual and cumulative adverse environmental effects are no more than minimal.

The construction and use of fills for temporary access for construction may be authorized by NWP 33 or regional general permits issued by division or district engineers. The related activity must meet the terms and conditions of the specified permit(s). If the discharge is dependent on portions of a larger project that require an individual permit, this NWP will not apply. [See 33 CFR 330.6(c) and (d)]

4.3 Cumulative Effects

4.3.1 General Analysis

The Council on Environmental Quality's (CEQ's) NEPA regulations define cumulative effects as: "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." [40 CFR 1508.7.] Therefore, the NEPA cumulative effects analysis for an NWP is not limited to activities authorized by the NWP, other NWPs, or other DA permits (individual permits and regional general permits). The NEPA cumulative effects analysis must also include other Federal and non-Federal activities that affect the Nation's wetlands, streams, and other aquatic resources, as well as other resources (e.g., terrestrial ecosystems, air) that may be directly or indirectly affected by the proposed action and other actions. According to guidance issued by CEQ (1997), a NEPA cumulative effects analysis should focus on specific categories of resources (i.e., resources of concern) identified during the review process as having significant cumulative effects concerns.

These cumulative effects analyses also require identification of the disturbances and stressors that cause degradation of those resources, including those caused by actions unrelated to the proposed action. A NEPA cumulative effects analysis does not need to analyze issues that have little relevance to the proposed action or the decision the agency will have to make (CEQ 1997).

The geographic scope of this cumulative effects analysis is the United States and its territories, where the NWP may be used to authorize specific activities that require DA authorization. The temporal scope of the cumulative effects analysis includes past federal, non-federal, and private actions that continue to affect the Nation's wetlands, streams, and other aquatic resources (including activities authorized by previously issued NWPs, regional general permits, and DA individual permits) as well as present and reasonably foreseeable future federal, non-federal, and private actions that are affecting, or will affect, wetlands, streams, and other aquatic resources. The present effects of past federal, non-federal, and private actions on wetlands, streams, and other aquatic resources are included in the affected environment, which is described in section 3.0. The affected environment described in section 3.0 also includes present effects of past actions, including activities authorized by NWPs issued from 1977 to 2012 and constructed by permittees, which are captured in national information on the quantity and quality of wetlands, streams, and other aquatic resources.

In addition to the activities authorized by this NWP, there are many categories of activities that contribute to cumulative effects on wetlands, streams, and other aquatic resources in the United States, and alter the quantity of those resources, the functions they perform, and the ecosystem services they provide. Activities authorized by past versions of NWP 48, as well as other NWPs, individual permits, letters of permission, and regional general permits have resulted in direct and indirect impacts to wetlands, streams, and other aquatic resources. Those activities may have legacy effects that have added to the cumulative effects and affected the quantity of those resources and the functions they provide. Discharges of dredged or fill material that do not require DA permits because they are exempt from section 404 permit requirements can also adversely affect the quantity of the Nation's wetlands, streams, and other aquatic resources and the functions and services they provide. Discharges of dredged or fill material that convert wetlands, streams, and other aquatic resources to upland areas result in permanent losses of aquatic resource functions and services. Temporary fills and fills that do not convert waters or wetlands to dry land may cause short-term or partial losses of aquatic resource functions and services.

Humans have long had substantial impacts on ecosystems and the ecological functions and services they provide (Ellis et al. 2010). Around the beginning of the 19th century, the degree of impacts of human activities on the Earth's ecosystems began to exceed the degree of impacts to ecosystems caused by natural disturbances and variability (Steffen et al. 2007). All of the Earth's ecosystems have been affected either directly or indirectly by human activities (Vitousek et al. 1997). Over 75 percent of the ice-free land on Earth has been altered by human occupation and use (Ellis and Ramankutty 2008). Approximately 33 percent of the Earth's ice-free land consists of lands heavily used by people: urban areas, villages, lands used to produce crops, and occupied rangelands (Ellis and Ramankutty 2008).

For marine ecosystems, Halpern et al. (2008) determined that there are no marine waters that are unaffected by human activities, and that 41 percent of the area of ocean waters are affected by multiple anthropogenic stressors (e.g., land use activities that generate pollution that go to coastal waters, marine habitat destruction or modification, and the extraction of resources). The marine waters most highly impacted by human activities are continental shelf and slope areas, which are affected by both land-based and ocean-based activities (Halpern et al. 2008). Human population density is a good indicator of the relative effect that people have had on local ecosystems, with lower population densities causing smaller impacts to ecosystems and higher population densities having larger impacts on ecosystems (Ellis and Ramankutty 2008). Human activities such as urbanization, agriculture, and forestry alter ecosystem structure and function by changing their interactions with other ecosystems, their biogeochemical cycles, and their species composition (Vitousek et al. 1997). Changes in land use reduce the ability of ecosystems to produce ecosystem services, such as food production, reducing infectious diseases, and regulating climate and air quality (Foley et al. 2005).

Recent changes in climate have had substantial impacts on natural ecosystems and human communities (IPCC 2014). Climate change, both natural and anthropogenic, is a major driving force for changes in ecosystem structure, function, and dynamics (Millar and Brubaker 2006). However, there are other significant drivers of change to aquatic and terrestrial ecosystems. In addition to climate change, aquatic and terrestrial ecosystems are also adversely affected by land use and land cover changes, natural resource extraction (including water withdrawals), pollution, species introductions, and removals of species (Staudt et al. 2013, Bodkin 2012, MEA 2005d) and changes in nutrient cycling (Julius et al. 2013).

Cumulative effects to wetlands, streams, and other aquatic resources in the United States are not limited to the effects caused by activities regulated and authorized by the Corps under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. Other federal, non-federal, and private activities also contribute to the cumulative effects to wetlands, streams, and other aquatic resources, by changing the quantity of those resources and the functions they provide. Wetlands, streams, and other aquatic resources and the functions and services they provide are directly and indirectly affected by changes in land use and land cover, alien species introductions, overexploitation of species, pollution, eutrophication due to excess nutrients, resource extraction including water withdrawals, climate change, and various natural disturbances (MEA 2005b). Freshwater ecosystems such as lakes, rivers, and streams are altered by changes to water flow, climate change, land use changes, additions of chemicals, resource extraction, and aquatic invasive species (Carpenter et al. 2011). Cumulative effects to wetlands, streams, and other aquatic resources are the result of landscape-level processes (Gosselink and Lee 1989). As discussed in more detail below, cumulative effects to aquatic resources are caused by a variety of activities (including activities that occur entirely in uplands) that take place within a landscape unit, such as the watershed for a river or stream (e.g., Allan 2004, Paul and Meyer 2001, Leopold 1968) or the contributing drainage area for a wetland (e.g., Wright et al. 2006, Brinson and Malvárez 2002, Zedler and Kercher 2005).

Cumulative effects also include environmental effects caused by reasonably foreseeable future actions that may take place after the permitted activity is completed. Such effects may include direct and indirect environmental effects caused by the operation and maintenance of the facility constructed on the discharge of dredged or fill material into waters of the United States or the structures or work in navigable waters of the United States. For NWP 48, this includes activities associated with the operation and maintenance of the commercial shellfish aquaculture activities authorized by this NWP. A variety of pollutants, including pesticides, might be released into the environment during the operation and maintenance of these activities. Those pollutants may be discharged through either point sources or non-point sources and reach jurisdictional waters and wetlands. Point-source discharges would likely require National Pollutant Discharge Elimination System Permits under Section 402 of the Clean Water Act, which is administered by U.S. EPA or by states with approved programs. Pollutants may also be discharged through spills and other accidents. Operations and maintenance activities may also have other direct and indirect effects on wetlands, streams, and other aquatic resources. The Corps does not have the authority to regulate operations and maintenance activities that: (1) do not involved discharges of dredged or fill material into waters of the United States; (2) involve activities exempt from Clean Water Act Section 404 permit requirements under section 404(f); and (3) do not involve structures or work requiring DA authorization under Sections 9 or 10 of the Rivers and Harbors Act of 1899. Reasonably foreseeable future actions regulated by the Corps are considered during the evaluation process.

In a specific watershed, division or district engineers may determine that the cumulative adverse environmental effects of activities authorized by this NWP are more than minimal. Division and district engineers will conduct more detailed assessments for geographic areas that are determined to be potentially subject to more than minimal cumulative adverse environmental effects. Division and district engineers have the authority to require individual permits in watersheds or other geographic areas where the cumulative adverse environmental effects are determined to be more than minimal, or add conditions to the NWP either on a case-by-case or regional basis to require mitigation measures to ensure that the cumulative adverse environmental effects of these activities are no more than minimal. When a division or district engineer determines, using local or regional information, that a watershed or other geographic area is subject to more than minimal cumulative adverse environmental effects due to the use of this NWP, he or she will use the revocation and modification procedure at 33 CFR 330.5. In reaching the final decision, the division or district engineer will compile information on the cumulative adverse effects and supplement this document.

The Corps expects that the convenience and time savings associated with the use of this NWP will encourage applicants to design their projects within the scope of the NWP rather than request individual permits for projects which could result in greater adverse impacts to the aquatic environment. The minimization encouraged by the issuance of this NWP, as well as compensatory mitigation that may be required for specific activities authorized by this NWP, will help reduce cumulative effects to the Nation's wetlands, streams, and other aquatic resources.

Cumulative effects to specific categories of resources (i.e., resources of concern in accordance with CEQ's (1997) guidance) are discussed in more detail below. As discussed above, in addition to activities regulated under section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act of 1899, there are many categories of activities that contribute to cumulative effects to the human environment. The activities authorized by this NWP during the 5-year period it will be in effect will result in no more than minimal incremental contributions to cumulative effects to these resource categories.

4.3.2 Cumulative Effects to Aquatic Ecosystems

The ecological condition of rivers and streams is dependent on the state of their watersheds (NRC 1992), because they are affected by activities that occur in those watersheds, including agriculture, urban development, deforestation, mining, water removal, flow alteration, and invasive species (Palmer et al. 2010). Land use changes affect rivers and streams through increased sedimentation, larger inputs of nutrients (e.g., nitrogen, phosphorous) and pollutants (e.g., heavy metals, synthetic chemicals, toxic organics), altered stream hydrology, the alteration or removal of riparian vegetation, and the reduction or elimination of inputs of large woody debris (Allan 2004). Agriculture is the primary cause of stream impairment, followed by urbanization (Foley et al. 2005, Paul and Meyer 2001). Agricultural land use adversely affects stream water quality, habitat, and biological communities (Allan 2004). Urbanization causes changes to stream hydrology (e.g., higher flood peaks, lower base flows), sediment supply and transport, water chemistry, and aquatic organisms (Paul and Meyer 2001). Leopold (1968) found that land use changes affect the hydrology of an area by altering stream flow patterns, total runoff, water quality, and stream structure. Changes in peak flow patterns and runoff affect stream channel stability. Stream water quality is adversely affected by increased inputs of sediments, nutrients, and pollutants, many of which come from non-point sources (Paul and Meyer 2001, Allan and Castillo 2007).

The construction and operation of water-powered mills in the 17th to 19th centuries substantially altered the structure and function of streams in the eastern United States (Walter and Merritts 2008) and those effects have persisted to the present time. In urbanized and agricultural watersheds, the number of small streams has been substantially reduced, in part by activities that occurred between the 19th and mid-20th centuries (Meyer and Wallace 2001). Activities that affect the quantity and quality of small streams include residential, commercial, and industrial development, mining, agricultural activities, forestry activities, and road construction (Meyer and Wallace 2001), even if those activities are located entirely in uplands.

Activities that affect wetland quantity and quality include: land use changes that alter local hydrology (including water withdrawal), clearing and draining wetlands, constructing levees that sever hydrologic connections between rivers and floodplain wetlands, constructing other obstructions to water flow (e.g., dams, locks), constructing water diversions, inputs of nutrients and contaminants, and fire suppression (Brinson and Malvárez 2002). Wetland loss and degradation is caused by hydrologic modifications of watersheds, drainage activities, logging, agricultural runoff, urban development, conversion to agriculture, aquifer depletion,

river management, (e.g., channelization, navigation improvements, dams, weirs), oil and gas development activities, levee construction, peat mining, and wetland management activities (Mitsch and Hernandez 2013). Upland development adversely affects wetlands and reduces wetland functionality because those activities change surface water flows and alter wetland hydrology, contribute stormwater and associated sediments, nutrients, and pollutants, cause increases in invasive plant species abundance, and decrease the diversity of native plants and animals (Wright et al. 2006). Many of the remaining wetlands in the United States are degraded (Zedler and Kercher 2005). Wetland degradation and losses are caused by changes in water movement and volume within a watershed or contributing drainage area, altered sediment transport, drainage, inputs of nutrients from non-point sources, water diversions, fill activities, excavation activities, invasion by non-native species, land subsidence, and pollutants (Zedler and Kercher 2005). According to Mitsch and Gosselink (2015), categories of activities that alter wetlands include: wetland conversion through drainage, dredging, and filling; hydrologic modifications that change wetland hydrology and hydrodynamics; highway construction and its effects on wetland hydrology; peat mining; waterfowl and wildlife management; agriculture and aquaculture activities; water quality enhancement activities; and flood control and stormwater protection.

There is also little national-level information on the ecological condition of the Nation's wetlands, streams, and other aquatic resources, or the amounts of functions they provide, although reviews have acknowledged that most of these resources are degraded (Zedler and Kercher 2005, Allan 2004) or impaired (U.S. EPA 2015) because of various activities, disturbances, and other stressors. These data deficiencies make it more difficult to characterize the affected environment to assess cumulative effects, and the relative contribution of the activities authorized by this NWP to those cumulative effects.

As discussed in section 3.0 of this document there is a wide variety of causes and sources of impairment of the Nation's rivers, streams, wetlands, lakes, estuarine waters, and marine waters (U.S. EPA 2015), which also contribute to cumulative effects to these aquatic resources. Many of those causes of impairment are point and non-point sources of pollutants that are not regulated under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899. Two common causes of impairment for rivers and streams, habitat alterations and flow alterations, may be due in part to activities regulated by the Corps under Section 404 of the Clean Water Act and/or Section 10 of the Rivers and Harbors Act of 1899. Habitat and flow alterations may also be caused by activities that do not involve discharges of dredged or fill material or structures or work in navigable waters. For wetlands, impairment due to habitat alterations, flow alterations, and hydrology modifications may involve activities regulated under section 404, but these causes of impairment may also be due to unregulated activities, such as changes in upland land use that affects the movement of water through a watershed or contributing drainage area or the removal of vegetation.

Many of the activities discussed in this cumulative effects section that affect wetlands, streams, and other aquatic resources are not subject to regulation under Section 404 of the Clean Water Act or Section 10 of the Rivers and Harbors Act of 1899.

Estimates of the original acreage of wetlands in the United States vary widely because of the use of different definitions and how those estimates were made (Harris and Gosselink 1990). Dahl (1990) estimates that approximately 53 percent of the wetlands in the conterminous United States were lost in the 200-year period covering the 1780s to 1980s. Much of the wetland loss occurred in the mid-19th century as a result of indirect effects of beaver trapping and the removal of river snags, which substantially reduced the amount of land across the country that was inundated because of beaver dams and river obstructions (Harris and Gosselink 1990). The annual rate of wetland loss has decreased substantially since the 1970s (Dahl 2011), when wetland regulation became more prevalent (Brinson and Malvárez 2002). Between 2004 and 2009, there was no statistically significant difference in wetland acreage in the conterminous United States (Dahl 2011). According to the 2011 wetland status and trends report, during the period of 2004 to 2009 urban development accounted for 11 percent of wetland losses (61,630 acres), rural development resulted in 12 percent of wetland losses (66,940 acres), silviculture accounted for 56 percent of wetland losses (307,340 acres), and wetland conversion to deepwater habitats caused 21 percent of the loss in wetland area (115,960 acres) (Dahl 2011). Some of the losses occurred to wetlands that are not subject to Clean Water Act jurisdiction and some losses are due to activities not regulated under Section 404 of the Clean Water Act, such as unregulated drainage activities, exempt forestry activities, or water withdrawals. From 2004 to 2009, approximately 100,020 acres of wetlands were gained as a result of wetland restoration and conservation programs on agricultural land (Dahl 2011). Another source of wetland gain is conversion of other uplands to wetlands (389,600 acres during 2004 to 2009) (Dahl 2011). Inventories of wetlands, streams, and other aquatic resources are incomplete, especially at national or regional scales, because the techniques used for those inventories cannot identify all of those resources, especially small wetlands and streams (e.g., Dahl (2011) for wetlands; Meyer and Wallace (2001) for streams).

As discussed in section 3.0, national scale inventories of wetlands, streams, and other types of aquatic resources underestimate the quantity of those resources, and only general information is available on their ability to perform ecological functions and services. Therefore, it is not appropriate to make decisions concerning the significance of cumulative effects by calculating the relative proportion of the aquatic resources baseline impacted by a particular action, or a series of actions subject to a particular federal program. In addition, such an approach does not take into account the many categories of other activities that have direct and indirect effects on aquatic resources that are regulated under other federal, states, or local programs or are not regulated by any entity. Under the Council on Environmental Quality's NEPA definition at 40 CFR 1508.7, a cumulative effects analysis should instead examine the relative contribution that a proposed action will have on cumulative effects to one or more categories of natural resources (i.e., "the incremental impact of the action" and whether that incremental impact is significant or not significant).

For aquatic ecosystems, climate change affects water quality, biogeochemical cycling, and water storage (Julius et al. 2013). Climate change will also affect the abundance and distribution of wetlands across the United States, as well as the functions they provide (Mitsch and Gosselink 2015). Climate change results in increases in stream temperatures, more waterbodies with anoxic conditions, degradation of water quality, and increases in

flood and drought frequencies (Julius et al. 2013). The increasing carbon dioxide concentration in the atmosphere also changes the pH of the oceans, resulting in ocean acidification (RS and NAS 2014), which adversely affects corals and some other marine organisms.

Compensatory mitigation required by district engineers for specific activities authorized by this NWP will help reduce the contribution of those activities to the cumulative effects on the Nation's wetlands, streams, and other aquatic resources, by providing ecological functions to partially or fully replace some or all of the aquatic resource functions lost as a result of those activities. Compensatory mitigation requirements for the NWPs are described in general condition 23 and compensatory mitigation projects must also comply with the applicable provisions of 33 CFR part 332. District engineers will establish compensatory mitigation requirements on a case-by-case basis, after evaluating pre-construction notifications. Compensatory mitigation requirements for individual NWP activities will be specified through permit conditions added to NWP authorizations. When compensatory mitigation is required, the permittee is required to submit a mitigation plan prepared in accordance with the requirements of 33 CFR 332.4(c). Credits from approved mitigation banks or in-lieu fee programs may also be used to satisfy compensatory mitigation requirements for NWP authorizations. Monitoring is required to demonstrate whether the permittee-responsible mitigation project, mitigation bank, or in-lieu fee project is meeting its objectives and providing the intended aquatic resource structure and functions. If the compensatory mitigation project is not meeting its objectives, adaptive management will be required. Adaptive management may involve taking actions, such as site modifications, remediation, or design changes, to ensure the compensatory mitigation project meets its objectives (see 33 CFR 332.7(c)).

The estimated contribution of activities authorized by this NWP to the cumulative effects to wetlands, streams, and other aquatic resources in the United States during the five year period that the NWP would be in effect, in terms of the estimated number of time this NWP would be used until it expires and the projected impacts and compensatory mitigation, is provided in section 7.2.2. It is not practical or feasible to provide quantitative data on the multitude of other contributors to cumulative effects to these resources, including the federal, non-federal, and private activities that are not regulated by the Corps that will also occur during the five year period this NWP is in effect. National-level data on these many categories of activities that are not regulated by the Corps but contribute to cumulative effects are either not collected for the nation or they are not accessible. The activities authorized by this NWP will result in a minor incremental contribution to the cumulative effects to wetlands, streams, and other aquatic resources in the United States because, as discussed in this section, they are one category of many categories of activities that affect those aquatic resources. The causes of cumulative effects discussed in this section include past, present, and reasonably foreseeable future federal, non-federal, and private activities. For the national-scale cumulative effects analysis presented in this section, it is not possible to quantify the relative contributions of all of the various activities that affect the quantity of wetlands, streams, and other aquatic resources and the functions and services they provide, because such data are not available at the national scale.

As discussed above, there are many categories of activities not regulated by the Corps under section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act of 1899 that contribute to cumulative effects to wetland, streams, and other aquatic resources. During the 5-year period this NWP is in effect, the activities it authorizes will result in only a no more than minimal incremental contribution to cumulative effects to wetlands, streams, and other aquatic ecosystems.

4.3.3 Cumulative Effects to Coastal Areas

In the United States, approximately 39 percent of its population lives in counties that are next to coastal waters, the territorial seas, or the Great Lakes (NOAA 2013). Those counties comprise less than 10 percent of the land area of the United States (NOAA 2013). Coastal waters are also affected by a wide variety of activities. The major drivers of changes to coastal areas are: development activities that alter coastal forests, wetlands, and coral reef habitats for aquaculture and the construction of urban areas, industrial facilities, and resort and port developments (MEA 2005d). Dredging, reclamation, shore protection and other structures (e.g., causeways and bridges), and some types of fishing activities also cause substantial changes to coastal areas (MEA 2005d). Nitrogen pollution to coastal zones change coral reef communities (MEA 2005d). Adverse effects to coastal waters are caused by habitat modifications, point source pollution, non-point source pollution, changes to hydrology and hydrodynamics, exploitation of coastal resources, introduction of non-native species, global climate change, shoreline erosion, and pathogens and toxins (NRC 1994).

Substantial alterations of coastal hydrology and hydrodynamics are caused by land use changes in watersheds draining to coastal waters, the channelization or damming of streams and rivers, water consumption, and water diversions (NRC 1994). Approximately 52 percent of the population of the United States lives in coastal watersheds (NOAA 2013). Eutrophication of coastal waters is caused by nutrients contributed by waste treatment systems, non-point sources, and the atmosphere, and may cause hypoxia or anoxia in coastal waters (NRC 1994). Changes in water movement through watersheds may also alter sediment delivery to coastal areas, which affects the sustainability of wetlands and intertidal habitats and the functions they provide (NRC 1994). Most inland waters in the United States drain to coastal areas, and therefore activities that occur in inland watersheds affect coastal waters (NRC 1994). Inland land uses, such as agriculture, urban development, and forestry, adversely affect coastal waters by diverting fresh water from estuaries and by acting as sources of nutrients and pollutants to coastal waters (MEA 2005d).

Coastal wetlands have been substantially altered by urban development and changes to the watersheds that drain to those wetlands (Mitsch and Hernandez 2013). Coastal habitat modifications are the result of dredging or filling coastal waters, inputs of sediment via non-point sources, changes in water quality, or alteration of coastal hydrodynamics (NRC 1994). Coastal development activities, including those that occur in uplands, affect marine and estuarine habitats (MEA 2005b). The introduction of non-native species may change the functions and structure of coastal wetlands and other habitats (MEA 2005b). Fishing activities may also modify coastal habitats by changing habitat structure and the biological communities that inhabit those areas (NRC 1994).

As discussed above, there are many categories of activities not regulated by the Corps under section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act of 1899 that contribute to cumulative effects to coastal areas. During the 5-year period this NWP is in effect, the activities it authorizes will result in only a no more than minimal incremental contribution to cumulative effects to coastal areas.

4.3.4 Cumulative Effects to Endangered and Threatened Species

The status of species as threatened or endangered is also due to cumulative effects (NRC 1986, Odum 1982), and activities authorized by Department of the Army permits are a minor contributor to the cumulative effects to endangered and threatened species. Land use and land cover changes are the main cause of the loss of biodiversity (Vitousek et al. 1997). The decline of a species that leads to its status as endangered or threatened is usually caused by multiple factors rather than a single factor (Wilcove et al. 1998, Venter et al. 2006, Czech and Krausman 1997, Richter et al. 1997). It is difficult to determine the relative contribution of each cause of species decline or endangerment (Czech and Krausman 1997). For example, for fish species, the number of factors affecting their status ranged from 1 to 15, with an average of 4.5 threats. Over 40 percent of fish species were endangered or threatened as a result of 5 or more factors, and less than 7 percent of fish species were identified as imperiled because of a single factor. During the past few hundred years, human activities have increased species extinction rates by around 1,000 times the Earth's background extinction rates (MEA 2005c).

The main causes of the decline of species to endangered or threatened status are habitat loss and degradation, introduction of species, overexploitation, disease, and climate change (MEA 2005d). Habitat degradation also includes changes in habitat quality caused by habitat fragmentation and pollution. Habitat fragmentation can occur in rivers, and is characterized by disruption of a river's natural flow regime by dams, inter-basin water transfers, or water withdrawals and affects 90 percent of the world's river water volume (MEA 2005d). Invasive alien species are a major cause of species endangerment in freshwater habitats (MEA 2005d). Losses of biological diversity are directly caused by habitat modifications, including land use changes, alteration of river and stream flows, water withdrawals from rivers, losses of coral reefs, and alteration of the sea bed caused by trawling (MEA 2005c). Other direct causes of losses of biodiversity include pollution, invasive species, species overexploitation, climate change, and disease (MEA 2005c). There are often multiple factors interacting with each other to reduce biodiversity, instead of single factors working alone (MEA 2005c).

Wilcove et al. (1998) evaluated five categories of threats to species in the United States, and conducted further analyses on the types of habitat destruction that caused species to be listed as endangered or threatened under the Endangered Species Act. The five categories of threats were habitat destruction, alien species, overharvest, pollution, and disease. Wilcove et al. (1998) focused on species under the jurisdiction of the U.S. Fish and Wildlife Service. More than half of the endangered and threatened species under the jurisdiction of the NMFS were listed after this study was published. Wilcove et al. (1998) found information on the

threats to 1,880 species, out of a total of 2,490 species that were categorized as imperiled at that time. Habitat destruction and degradation was the most common threat, a factor for 85 percent of the imperiled species analyzed. The second most common threat was competition with non-native species, or predation by those species. For aquatic animal species, pollution was the second most common cause of endangerment, after habitat loss (Wilcove et al. 1998).

To more closely examine the causes of habitat loss, Wilcove et al. (1998) analyzed U.S. Fish and Wildlife endangered species listing documents and identified 14 categories of habitat loss or degradation: agriculture; livestock grazing; mining and oil and gas extraction; logging; infrastructure development; road construction and maintenance; military activities; outdoor recreation; use of off-road vehicles; water development projects (e.g., water diversions, flood control facilities; drainage projects; aquaculture; navigation); dams, impoundments, and other water barriers; pollutants (e.g., sediment and mining pollutants); residential and commercial developments; and disruption of fire ecology. Many species were subject to more than one cause of endangerment (Wilcove et al. 1998). Agriculture was the leading cause of habitat destruction, affecting 38 percent of endangered species, followed by residential and commercial development (35 percent), water development (30 percent), and infrastructure development (17 percent). Habitat destruction caused by water development affected 91 percent of listed fish species and 99 percent of listed mussel species.

Richter et al. (1997) studied the factors that endanger freshwater animals. The most significant threats to those species are habitat destruction, habitat fragmentation, pollution, and exotic species. Richter et al. (1997) also looked at the stressors that are impeding the recovery of aquatic species at risk of extinction and found that changes in stream bed substrate composition (e.g., siltation), hydrologic alteration, interactions with other species, nutrient inputs, and habitat destruction were the most common factors. The major sources of stressors to aquatic species are agricultural land use, urban land use, energy generation industries (especially hydroelectric power), and exotic species (Richter et al. 1997). Agricultural activity was identified as having significant adverse effects on aquatic species through non-point source pollution (sediment and nutrients), interactions with exotic species, and water impoundments (Richter et al. 1997). Water impoundments cause changes in hydrology, as well as habitat destruction and fragmentation. Urban land use resulted in much less non-point source pollution than agricultural activities (Richter et al. 1997).

Note that in these studies on species threats and endangerment, the categories of human activities are discussed in general terms, and may include activities in uplands as well as activities in jurisdictional and non-jurisdictional waters and wetlands. Climate change will also alter species distributions, and extinction may occur for those species that cannot adjust to the changes in climate (Starzmoski 2013).

As discussed above, there are many categories of activities not regulated by the Corps under section 404 of the Clean Water Act and/or section 10 of the Rivers and Harbors Act of 1899 that contribute to cumulative effects to endangered and threatened species and their designated critical habitats. During the 5-year period this NWP is in effect, the activities it

authorizes will result in only a no more than minimal incremental contribution to cumulative effects to endangered and threatened species and their habitats.

4.4 Climate Change

Climate change represents one of the greatest challenges our country faces with profound and wide-ranging implications for the health and welfare of Americans, economic growth, the environment, and international security. Evidence of the warming of climate system is unequivocal and the emission of greenhouse gases from human activities is the primary driver of these changes (IPCC 2014). Already, the United States is experiencing the impacts of climate change and these impacts will continue to intensify as warming intensifies. It will have far-reaching impacts on natural ecosystems and human communities. These effects include sea level rise, ocean warming, increases in precipitation in some areas and decreases in precipitation in other areas, decreases in sea ice, more extreme weather and climate events including more floods and droughts, increasing land surface temperatures, increasing ocean temperatures, and changes in plant and animal communities (IPCC 2014). Climate change also affects human health in some geographic area by increasing exposure to ground-level ozone and/or particulate matter air pollution (Luber et al. 2014). Climate change also increases the frequency of extreme heat events that threaten public health and increases risk of exposure to vector-borne diseases (Luber et al. 2014). Climate impacts affect the health, economic well-being, and welfare of Americans across the country, and especially children, the elderly, and others who are particularly vulnerable to specific impacts. Climate change can affect ecosystems and species through a number of mechanisms, such as direct effects on species, populations, and ecosystems; compounding the effects of other stressors; and the direct and indirect effects of climate change mitigation or adaptation actions (Staudt et al. 2013). Other stressors include land use and land cover changes, natural resource extraction (including water withdrawals), pollution, species introductions, and removals of species (Staudt et al. 2013, Bodkin 2012, MEA 2005d) and changes in nutrient cycling (Julius et al. 2013).

5.0 Public Interest Review

5.1 Public Interest Review Factors (33 CFR 320.4(a)(1))

For each of the 20 public interest review factors, the extent of the Corps consideration of expected impacts resulting from the use of this NWP is discussed, as well as the reasonably foreseeable cumulative adverse effects that are expected to occur. The Corps decision-making process involves consideration of the benefits and detriments that may result from the activities authorized by this NWP.

(a) Conservation. The activities authorized by this NWP will result in minor changes to the natural resource characteristics of the project area, since the NWP authorizes commercial

shellfish aquaculture activities. Mitigation measures may be required to minimize impacts to conservation values. Dumbauld and McCoy (2015) recommend examining the effects of oyster aquaculture activities on eelgrass at the scale of estuarine ecosystems because such a perspective indicates that those aquaculture activities have relatively small impacts on seagrasses and that seagrasses recover quickly after disturbance.

(b) Economics. Commercial shellfish aquaculture activities will have positive impacts on the local economy. These activities will generate jobs and revenue for local growers as well as revenue to supply companies that sell materials used for these activities. Commercial shellfish aquaculture activities supply seafood for restaurants and other consumers. The authorized aquaculture activities will also benefit the community by improving the local economic base, which is affected by employment, tax revenues, community services, and property values.

(c) Aesthetics. Commercial shellfish aquaculture activities may alter the visual character of some waters of the United States, but such changes will be minor. The extent and perception of these changes will vary, depending on the size and configuration of the aquaculture activity, the nature of the surrounding area, and the public uses of the area. The use of the project area and the surrounding land may also alter local aesthetic values. Commercial shellfish aquaculture operators may discard equipment, such as PVC tubes, plastic lines, and canopy nets that impair the aesthetics of the waters and shoreline in the vicinity of the operation.

(d) General environmental concerns. Activities authorized by this NWP will affect general environmental concerns, such as water, air, noise, and land pollution. The authorized activities will also affect the physical, chemical, and biological characteristics of the aquatic environment. The adverse effects of the activities authorized by this NWP on general environmental concerns will be minor. At moderate population densities, commercially produced shellfish populations may improve general environmental concerns, such as water and habitat quality, within navigable waters by removing suspended materials and plankton from the water column in waters subject to eutrophication and by providing physical structure to the waterbody that can be used as habitat by some aquatic organisms (Dumbauld et al. 2009). Adverse effects to the chemical composition of the aquatic environment will be controlled by general condition 6, which states that the material used for construction must be free from toxic pollutants in toxic amounts. General condition 23 requires mitigation to minimize adverse effects to the aquatic environment through avoidance and minimization at the project site. Mitigation may be required by district engineers to ensure that the net adverse effects on the aquatic environment are minimal. Specific environmental concerns are addressed in other sections of this document.

(e) Wetlands. The commercial shellfish aquaculture activities authorized by this NWP may result in impacts to tidal wetlands. In many cases the impacts will be temporary since the commercial shellfish aquaculture activities primarily occur in open waters. This NWP does not authorize attendant features that might result in the loss of wetlands, such as boat ramps, stockpiles, or staging areas. Impacts to wetlands will be minor.

Wetlands provide habitat, including foraging, nesting, spawning, rearing, and resting sites for aquatic and terrestrial species. The loss or alteration of wetlands may alter natural drainage patterns. Wetlands reduce erosion by stabilizing the substrate. Wetlands also act as storage areas for stormwater and flood waters. The loss of wetland vegetation will adversely affect water quality because these plants trap sediments, pollutants, and nutrients and transform chemical compounds. Wetland vegetation also provides habitat for microorganisms that remove nutrients and pollutants from water. Wetlands, through the accumulation of organic matter, act as sinks for some nutrients and other chemical compounds, reducing the amounts of these substances in the water.

General condition 23 requires avoidance and minimization of impacts to waters of the United States, including wetlands, at the project site. Division engineers can regionally condition this NWP to restrict or prohibit the use of this NWP in high value tidal wetlands. District engineers will also exercise discretionary authority to require an individual permit if the wetlands to be filled are high value and the activity will result in more than minimal adverse environmental effects. District engineers can also add case-specific special conditions to the NWP authorization to provide protection to wetlands.

(f) Historic properties. General condition 20 states that in cases where the district engineer determines that the activity may affect properties listed, or eligible for listing, in the National Register of Historic Places, the activity is not authorized, until the requirements of Section 106 of the National Historic Preservation Act have been satisfied.

(g) Fish and wildlife values. This NWP authorizes activities in tidal waters of the United States, which provide habitat to many species of fish and wildlife. Activities authorized by this NWP may alter the habitat characteristics of tidal waters. Some species of aquatic organisms will benefit from those changes, while other species will be adversely affected (Dumbauld et al. 2009). Tidal waters, including tidal wetlands and vegetated shallows, provides food and habitat for many species, including foraging areas, resting areas, corridors for fish movement, and nesting and breeding grounds. Open waters provide habitat for fish and other aquatic organisms. Equipment used for commercial shellfish aquaculture activities, such as canopy nets, may impede bird feeding activity and trap birds. Pre-construction notification is required for activities authorized by this NWP if: (1) the activity will include a species that has never been cultivated in the waterbody; or (2) the activity occurs in an area that has not been used for commercial shellfish aquaculture activities during the past 100 years. The pre-construction notification requirements provides the district engineer with an opportunity to review those activities and assess potential impacts on fish and wildlife values and ensure that the authorized activity results in no more than minimal adverse environmental effects.

General condition 2 will reduce adverse effects to fish and other aquatic species by prohibiting activities that substantially disrupt the movement of indigenous aquatic species, unless the primary purpose of the activity is to impound water. Compliance with general conditions 3 and 5 will ensure that the authorized activity has no more than minimal adverse effects on spawning areas and shellfish beds, respectively. The authorized activity cannot have more than minimal adverse effects on breeding areas for migratory birds, due to the

requirements of general condition 4.

For an NWP activity, compliance with the Bald and Golden Eagle Protection Act (16 U.S.C. 668(a)-(d)), the Migratory Bird Treaty Act (16 U.S.C. 703; 16 U.S.C. 712), and the Marine Mammal Protection Act (16 U.S.C. 1361 et seq.) is the responsibility of the project proponent. General condition 19 states that the permittee is responsible for contacting appropriate local office of the U.S. Fish and Wildlife Service to determine applicable measures to reduce impacts to migratory birds or eagles, including whether “incidental take” permits are necessary and available under the Migratory Bird Treaty Act or Bald and Golden Eagle Protection Act for a particular activity.

Consultation pursuant to the essential fish habitat provisions of the Magnuson-Stevens Fishery Conservation and Management Act will occur as necessary for proposed NWP activities that may adversely affect essential fish habitat. Consultation may occur on a case-by-case or programmatic basis. Division and district engineers can impose regional and special conditions to ensure that activities authorized by this NWP will result in only minimal adverse effects on essential fish habitat.

Dumbauld and McCoy (2015) found that while oyster aquaculture has a negative effect on eelgrass populations in an estuary in Washington State, that negative effect is small when considered in light of the large areas occupied by eelgrass and oysters within that estuary. Tallis et al. (2009) concluded that eelgrass populations in estuaries were affected by biological and physical factors caused by shellfish aquaculture activities, and eelgrass co-exists with oyster aquaculture in vigorous populations.

(h) Flood hazards. The activities authorized by this NWP will have little or no adverse effects on the flood-holding capacity of 100-year floodplains, since these activities occur in either open navigable waters or intertidal waters. Compliance with general condition 9 will reduce flood hazards. This general condition requires the permittee to maintain, to the maximum extent practicable, the pre-construction course, condition, capacity, and location of open waters, except under certain circumstances.

(i) Floodplain values. Activities authorized by this NWP will have negligible adverse effects on the flood-holding capacity of the floodplain, as well as other floodplain values, since it authorizes only commercial shellfish aquaculture activities, which occur in open waters. For those activities that require pre-construction notification, district engineers will review the proposed activities to ensure that those activities result in no more than minimal adverse effects on floodplain values.

General condition 23 requires avoidance and minimization of impacts to waters of the United States to the maximum extent practicable at the project site, which will reduce losses of floodplain values.

(j) Land use. Activities authorized by this NWP will have little or no adverse effect on land use, since it is limited to commercial shellfish aquaculture activities, and those activities usually occur in navigable waters identified through a lease or permit issued by an appropriate state or local government agency, a treaty, or any other easement, lease, deed, or

contract which establishes an enforceable property interest for the grower. Since the primary responsibility for land use decisions is held by state, local, and Tribal governments, the Corps scope of review is limited to significant issues of overriding national importance, such as navigation and water quality (see 33 CFR 320.4(j)(2)).

(k) Navigation. Activities authorized by this NWP will not adversely affect navigation, because these activities must comply with general condition 1. Certain activities authorized by this NWP, such as changing from bottom culture to floating or suspended culture methods, require pre-construction notification, which will allow district engineers to review those activities and determine if there will be any adverse effects on navigation.

(l) Shore erosion and accretion. The activities authorized by this NWP will have minor direct effects on shore erosion and accretion processes, since the NWP is limited to commercial shellfish aquaculture activities that occur in open waters. These activities generally occur in tidal waters. However, NWP 13, regional general permits, or individual permits may be used to authorize bank stabilization projects associated with commercial shellfish aquaculture activities. The effects of those bank stabilization projects on shore erosion and accretion will be evaluated through that authorization process.

(m) Recreation. Activities authorized by this NWP will have minor changes on the recreational uses of the area, since the NWP authorizes only commercial shellfish aquaculture activities in areas that have already been identified through leases or permits issued by state or local government agencies, a treaty, or any other easement, lease, deed, or contract that establishes an enforceable property interest for the operator. Certain recreational activities, such as bird watching, hunting, and fishing would still be available in the area.

(n) Water supply and conservation. Activities authorized by this NWP will not adversely affect surface water and groundwater supplies. This NWP authorizes commercial shellfish aquaculture activities, which usually occur in tidal waters. These activities will not increase demand for potable water in the region. Activities authorized by this NWP will not adversely affect the quality of water supplies, since they generally occur in marine and estuarine waters. Many causes of water pollution, such as discharges regulated under Section 402 of the Clean Water Act, are outside the Corps scope of review. Some water pollution concerns can be addressed through water quality management measures that may be required for activities authorized by this NWP. General condition 7 prohibits discharges in the vicinity of public water supply intakes.

(o) Water quality. Commercial shellfish aquaculture activities may have minor adverse effects on water quality. Large populations of the species raised through commercial shellfish aquaculture activities can increase in nutrients and other and pollutants in the water.

During commercial shellfish aquaculture operations, small amounts of oil and grease from production or harvesting equipment may be discharged into the waterway. Because most production or harvesting activities will occur during a relatively short period of time, the

frequency and concentration of these discharges are not expected to have more than minimal adverse effects on overall water quality.

This NWP requires water quality certification, since it authorizes discharges of dredged or fill material into waters of the United States. Most water quality concerns are addressed by the state or Tribal water quality certification agency. In accordance with general condition 25, the permittee may be required to develop and implement water quality management measures that minimizes the degradation of the aquatic environment, including water quality. The district engineer may require water quality management measures to ensure that adverse effects to water quality are no more than minimal.

(p) Energy needs. The activities authorized by this NWP will result in negligible changes in energy consumption in the area, because the NWP authorizes only certain aspects of commercial shellfish aquaculture activities, specifically structures or work in navigable waters and discharges of dredged or fill material into those waters. Therefore, consumption of electricity, natural gas, and petroleum products is unlikely to change.

(q) Safety. The activities authorized by this NWP will be subject to Federal, state, and local safety laws and regulations. Therefore, this NWP will not adversely affect the safety of the project area.

(r) Food and fiber production. Activities authorized by this NWP will normally increase food production, through the production of commercial shellfish species. The activities authorized by this NWP will not adversely affect fiber production. These activities will not change the amount of available agricultural land in the nation. The loss of farmland will be negligible, because the activities authorized by this NWP occur in navigable waters.

(s) Mineral needs. Activities authorized by this NWP will have little or no adverse effects on demand for aggregates and stone, since these materials are usually not used for commercial shellfish aquaculture activities. Activities authorized by this NWP may increase the demand for other materials, such as steel, aluminum, and copper, which are made from mineral ores.

(t) Considerations of property ownership. The NWP complies with 33 CFR 320.4(g), which states that an inherent aspect of property ownership is a right to reasonable private use. The NWP provides expedited DA authorization for commercial shellfish aquaculture activities, provided those activities comply with the terms and conditions of the NWP and result in no more than minimal adverse environmental effects.

5.2 Additional Public Interest Review Factors (33 CFR 320.4(a)(2))

5.2.1 Relative extent of the public and private need for the proposed structure or work

This NWP authorizes activities in waters of the United States, especially navigable waters, for commercial shellfish aquaculture activities as long as those activities have no more than minimal individual and cumulative adverse environmental effects. These activities satisfy public and private needs for food and other products. The need for this NWP is based upon the number of these activities that occur annually with only minimal individual and cumulative adverse environmental effects.

5.2.2 Where there are unresolved conflicts as to resource use, the practicability of using reasonable alternative locations and methods to accomplish the objective of the proposed structure or work

Most situations in which there are unresolved conflicts concerning resource use arise when environmentally sensitive areas are involved (e.g., special aquatic sites, including wetlands) or where there are competing uses of a resource. The nature and scope of the activity, when planned and constructed in accordance with the terms and conditions of this NWP, reduce the likelihood of such conflict. In the event that there is a conflict, the NWP contains provisions that are capable of resolving the matter (see Section 1.2 of this document).

General condition 23 requires permittees to avoid and minimize adverse effects to waters of the United States to the maximum extent practicable on the project site. Consideration of off-site alternative locations is not required for activities that are authorized by general permits. General permits authorize activities that have no more than minimal individual and cumulative adverse effects on the environment and the overall public interest. The district engineer will exercise discretionary authority and require an individual permit if the proposed activity will result in more than minimal adverse environmental effects on the project site. The consideration of off-site alternatives can be required during the individual permit process.

5.2.3 The extent and permanence of the beneficial and/or detrimental effects which the proposed structure or work is likely to have on the public and private uses to which the area is suited

The nature and scope of the activities authorized by the NWP will most likely restrict the extent of the beneficial and detrimental effects to the area immediately surrounding the commercial shellfish aquaculture activity. Activities authorized by this NWP will have no more than minimal individual and cumulative adverse environmental effects.

The terms, conditions, and provisions of the NWP were developed to ensure that individual and cumulative adverse environmental effects are no more than minimal. Specifically, NWPs do not obviate the need for the permittee to obtain other Federal, state, or local authorizations required by law. The NWPs do not grant any property rights or exclusive privileges (see 33 CFR 330.4(b) for further information). Additional conditions, limitations,

restrictions, and provisions for discretionary authority, as well as the ability to add activity-specific or regional conditions to this NWP, will provide further safeguards to the aquatic environment and the overall public interest. There are also provisions to allow suspension, modification, or revocation of the NWP.

6.0 Endangered and Threatened Species

The Corps' current regulations and procedures for the NWPs result in compliance with Section 7 of the Endangered Species Act (ESA) and ensure that activities authorized by this NWP will not jeopardize the continued existence or any listed threatened and endangered species or result in the destruction or adverse modification of critical habitat. Current local procedures in Corps districts are effective in ensuring compliance with ESA. Those local procedures include regional programmatic consultations and the development of Standard Local Operating Procedures for Endangered Species (SLOPES). The issuance or reissuance of an NWP, as governed by NWP general condition 18 (which applies to every NWP and which relates to endangered and threatened species and critical habitat) and 33 CFR 330.4(f), results in "no effect" to listed species or critical habitat, because no activity that "may affect" listed species or critical habitat is authorized by NWP unless ESA Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) and/or National Marine Fisheries Service (NMFS) has been completed. Activities that do not comply with general condition 18 or other applicable general or regional conditions are not authorized by any NWP, and thus fall outside of the NWP Program. Unauthorized activities are subject to the prohibitions of Section 9 of the ESA.

Each activity authorized by an NWP is subject to general condition 18, which states that "[n]o activity is authorized under any NWP which is likely to directly or indirectly jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will directly or indirectly destroy or adversely modify the critical habitat of such species." In addition, general condition 18 explicitly states that the NWP does not authorize "take" of threatened or endangered species, which will ensure that permittees do not mistake the NWP authorization as a Federal authorization to take threatened or endangered species. General condition 18 also requires a non-federal permittee to submit a pre-construction notification to the district engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or if the project is located in designated critical habitat. This general condition also states that, in such cases, non-federal permittees shall not begin work on the activity until notified by the district engineer that the requirements of the ESA have been satisfied and that the activity is authorized.

Under the current Corps regulations (33 CFR 325.2(b)(5)), the district engineer must review all permit applications for potential impacts on threatened and endangered species or critical habitat. For the NWP program, this review occurs when the district engineer evaluates the pre-construction notification or request for verification. Nationwide permit general condition 18 requires a non-federal applicant to submit a pre-construction notification to the Corps if any listed species or designated critical habitat might be affected or is in the vicinity

of the project, or if the project is located in designated critical habitat. Based on the evaluation of all available information, the district engineer will initiate consultation with the USFWS or NMFS, as appropriate, if he or she determines that the proposed activity may affect any threatened and endangered species or critical habitat. Consultation may occur during the NWP authorization process or the district engineer may exercise discretionary authority to require an individual permit for the proposed activity and initiate section 7 consultation during the individual permit process. If ESA Section 7 consultation is conducted during the NWP authorization process without the district engineer exercising discretionary authority, then the applicant will be notified that he or she cannot proceed with the proposed NWP activity until section 7 consultation is completed.

If the district engineer determines that the proposed NWP activity will have no effect on any threatened or endangered species or critical habitat, then the district engineer will notify the applicant that he or she may proceed under the NWP authorization as long as the activity complies with all other applicable terms and conditions of the NWP, including applicable regional conditions. When the Corps makes a “no effect” determination, that determination is documented in the record for the NWP verification.

In cases where the Corps makes a “may affect” determination, formal or informal section 7 consultation is conducted before the activity is authorized by NWP. A non-federal permit applicant cannot begin work until notified by the Corps that the proposed NWP activity will have “no effect” on listed species or critical habitat, or until ESA Section 7 consultation has been completed (see also 33 CFR 330.4(f)). Federal permittees are responsible for complying with ESA Section 7(a)(2) and should follow their own procedures for complying with those requirements (see 33 CFR 330.4(f)(1)). Therefore, permittees cannot rely on complying with the terms of an NWP without considering ESA-listed species and critical habitat, and they must comply with the NWP conditions to ensure that they do not violate the ESA. General condition 18 also states that district engineers may add activity-specific conditions to the NWPs to address ESA issues as a result of formal or informal consultation with the USFWS or NMFS.

Each year, the Corps conducts thousands of ESA section 7 consultations with the FWS and NMFS for activities authorized by NWPs. These section 7 consultations are tracked in ORM2. During the period of March 19, 2012, to September 30, 2016, Corps districts conducted 1,402 formal consultations and 9,302 informal consultations for NWP activities under ESA section 7. During that time period, the Corps also used regional programmatic consultations for 9,829 NWP verifications to comply with ESA section 7. Therefore, each year NWP activities are covered by an average of more than 4,500 formal, informal, and programmatic ESA section 7 consultations with the FWS and/or NMFS. In a study on ESA section 7 consultations tracked by the USFWS, Malcom and Li (2015) found that during the period of 2008 to 2015, the Corps conducted the most formal and informal section 7 consultations, far exceeding the numbers of section 7 consultations conducted by other federal agencies.

Section 7 consultations are often conducted on a case-by-case basis for activities proposed to be authorized by NWP that may affect listed species or critical habitat, in accordance with

the USFWS's and NMFS's interagency regulations at 50 CFR part 402. Instead of activity-specific section 7 consultations, compliance with ESA may also be achieved through formal or informal regional programmatic consultations. Compliance with ESA Section 7 may also be facilitated through the adoption of NWP regional conditions. In some Corps districts SLOPES have been developed through consultation with the appropriate regional offices of the USFWS and NMFS to make the process of complying with section 7 more efficient.

Corps districts have, in most cases, established informal or formal procedures with local offices of the USFWS and NMFS, through which the agencies share information regarding threatened and endangered species and their critical habitat. This information helps district engineers determine if a proposed NWP activity may affect listed species or their critical habitat and, when a "may affect" determination is made, initiate ESA section 7 consultation. Corps districts may utilize maps or databases that identify locations of populations of threatened and endangered species and their critical habitat. Where necessary, regional conditions are added to one or more NWPs to require pre-construction notification for NWP activities that occur in known locations of threatened and endangered species or critical habitat. For activities that require agency coordination during the pre-construction notification process, the USFWS and NMFS will review the proposed activities for potential impacts to threatened and endangered species and their critical habitat. Any information provided by local maps and databases and any comments received during the pre-construction notification review process will be used by the district engineer to make a "no effect" or "may affect" determination for the pre-construction notification.

Based on the safeguards discussed in this section, especially general condition 18 and the NWP regulations at 33 CFR 330.4(f), the Corps has determined that the activities authorized by this NWP will not jeopardize the continued existence of any listed threatened or endangered species or result in the destruction or adverse modification of designated critical habitat. Although the Corps continues to believe that these procedures ensure compliance with the ESA, the Corps has taken some steps to provide further assurance. Corps district offices meet with local representatives of the USFWS and NMFS to establish or modify existing procedures such as regional conditions, where necessary, to ensure that the Corps has the latest information regarding the existence and location of any threatened or endangered species or their critical habitat. Corps districts can also establish, through local procedures or other means, additional safeguards that ensure compliance with the ESA. Through ESA Section 7 formal or informal consultations, or through other coordination with the USFWS and NMFS, the Corps establishes procedures to ensure that the NWP is not likely to jeopardize any threatened and endangered species or result in the destruction or adverse modification of designated critical habitat. Such procedures may result in the development of regional conditions added to the NWP by the division engineer, or in conditions to be added to a specific NWP authorization by the district engineer.

If informal section 7 consultation is conducted, and the USFWS and/or NMFS issues a written concurrence that the proposed activity may affect, but is not likely to adversely affect, listed species or designated critical habitat, the district engineer will add conditions (e.g., minimization measures) to the NWP authorization that are necessary to avoid the likelihood of adverse effects to listed species or designated critical habitat. If the USFWS

and/or NMFS does not issue a written concurrence that the proposed NWP activity “may affect, but is not likely to adversely affect” listed species or critical habitat, the Corps will initiate formal section 7 consultation if it changes its determination to “may affect, likely to adversely affect.”

If formal section 7 consultation is conducted and a biological opinion is issued, the district engineer will add a condition to the NWP authorization to incorporate the appropriate elements of the incidental take statement of the biological opinion into the NWP authorization, if the biological opinion concludes that the activity is not likely to jeopardize the continued existence of listed species or adversely modify or destroy critical habitat. If the biological opinion concludes that the proposed activity is likely to jeopardize the continued existence of listed species or adversely modify or destroy critical habitat, the proposed activity cannot be authorized by NWP and the district engineer will instruct the applicant to apply for an individual permit. The incidental take statement includes reasonable and prudent measures such as mitigation, monitoring, and reporting requirements that minimize incidental take. The appropriate elements of the incidental take statement are dependent on those activities in the biological opinion over which the Corps has control and responsibility (i.e., the discharges of dredged or fill material into waters of the United States and/or structures or work in navigable waters and their direct and indirect effects on listed species or critical habitat). The appropriate elements of the incidental take statement are those reasonable and prudent measures that the Corps has the authority to enforce under its permitting authorities. Incorporation of the appropriate elements of the incidental take statement into the NWP authorization by a binding, enforceable permit condition provides an exemption from the take prohibitions in ESA Section 9 (see Section 7(o)(2) of the ESA).

The Corps can modify this NWP at any time that it is deemed necessary to protect listed species or their critical habitat, either through: 1) national general conditions or national-level modifications, suspensions, or revocations of the NWPs; 2) regional conditions or regional modifications, suspensions, or revocations of NWPs; or 3) activity-specific permit conditions (modifications) or activity-specific suspensions or revocations of NWP authorizations. Therefore, although the Corps has issued the NWPs, the Corps can address any ESA issue, if one should arise. The NWP regulations also allow the Corps to suspend the use of some or all of the NWPs immediately, if necessary, while considering the need for permit conditions, modifications, or revocations. These procedures are provided at 33 CFR 330.5.

7.0 Clean Water Act Section 404(b)(1) Guidelines Analysis

The 404(b)(1) Guidelines compliance criteria for general permits are provided at 40 CFR 230.7. This 404(b)(1) Guidelines compliance analysis includes analyses of the direct, secondary, and cumulative effects on the aquatic environment caused by discharges of dredged or fill material authorized by this NWP.

7.1 Evaluation Process (40 CFR 230.7(b))

7.1.1 Alternatives (40 CFR 230.10(a))

General condition 23 requires permittees to avoid and minimize discharges of dredged or fill material into waters of the United States to the maximum extent practicable on the project site. The consideration of off-site alternatives is not directly applicable to general permits (see 40 CFR 230.7(b)(1)).

7.1.2 Prohibitions (40 CFR 230.10(b))

This NWP authorizes discharges of dredged or fill material into waters of the United States, which require water quality certification. Water quality certification requirements will be met in accordance with the procedures at 33 CFR 330.4(c).

No toxic discharges will be authorized by this NWP. General condition 6 states that the material must be free from toxic pollutants in toxic amounts.

This NWP does not authorize activities that jeopardize the continued existence of any listed threatened or endangered species or result in the destruction or adverse modification of critical habitat. Reviews of preconstruction notifications, regional conditions, and local operating procedures for endangered species will ensure compliance with the Endangered Species Act. Refer to general condition 18 and to 33 CFR 330.4(f) for information and procedures.

This NWP will not authorize the violation of any requirement to protect any marine sanctuary. Refer to section 7.2.3(j)(1) of this document for further information.

7.1.3 Findings of Significant Degradation (40 CFR 230.10(c))

Potential impact analysis (Subparts C through F): The potential impact analysis specified in Subparts C through F is discussed in section 7.2.3 of this document. Mitigation required by the district engineer will ensure that the adverse effects on the aquatic environment are no more than minimal.

Evaluation and testing (Subpart G): Because the terms and conditions of the NWP specify the types of discharges that are authorized, as well as those that are prohibited, individual evaluation and testing for the presence of contaminants will normally not be required. If a situation warrants, provisions of the NWP allow division or district engineers to further specify authorized or prohibited discharges and/or require testing. General condition 6 requires that materials used for construction be free from toxic pollutants in toxic amounts.

Based upon Subparts B and G, after consideration of Subparts C through F, the discharges authorized by this NWP will not cause or contribute to significant degradation of waters of the United States.

7.1.4 Factual determinations (40 CFR 230.11)

The factual determinations required in 40 CFR 230.11 are discussed in section 7.2.3 of this document.

7.1.5 Appropriate and practicable steps to minimize potential adverse impacts (40 CFR 230.10(d))

As demonstrated by the information in this document, as well as the terms, conditions, and provisions of this NWP, actions to minimize adverse effects (Subpart H) have been thoroughly considered and incorporated into the NWP. General condition 23 requires permittees to avoid and minimize discharges of dredged or fill material into waters of the United States to the maximum extent practicable on the project site. Compensatory mitigation may be required by the district engineer to ensure that the net adverse effects on the aquatic environment are no more than minimal.

7.2 Evaluation Process (40 CFR 230.7(b))

7.2.1 Description of permitted activities (40 CFR 230.7(b)(2))

As indicated by the text of this NWP in section 1.0 of this document, and the discussion of potential impacts in section 4.0, the activities authorized by this NWP are sufficiently similar in nature and environmental impact to warrant authorization under a single general permit. Specifically, the purpose of the NWP is to authorize discharges of dredged or fill material for commercial shellfish aquaculture activities. The nature and scope of the impacts are controlled by the terms and conditions of the NWP.

The activities authorized by this NWP are sufficiently similar in nature and environmental impact to warrant authorization by a general permit. The terms of the NWP authorize a specific category of activity (i.e., discharges of dredged or fill material for the operation of commercial shellfish aquaculture activities) in a specific category of waters (i.e., navigable waters of the United States). The restrictions imposed by the terms and conditions of this NWP will result in the authorization of activities that have similar impacts on the aquatic environment, namely the modification of aquatic habitats, such as estuarine and marine waters, through commercial shellfish aquaculture activities.

If a situation arises in which the activity requires further review, or is more appropriately reviewed under the individual permit process, provisions of the NWPs allow division and/or district engineers to take such action.

7.2.2 Cumulative effects (40 CFR 230.7(b)(3))

The 404(b)(1) Guidelines at 40 CFR 230.11(a) define cumulative effects as "...the changes in an aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material." For the issuance of general permits, such as this

NWP, the 404(b)(1) Guidelines require the permitting authority to “set forth in writing an evaluation of the potential individual and cumulative impacts of the categories of activities to be regulated under the general permit.” [40 CFR 230.7(b)] More specifically, the 404(b)(1) Guidelines cumulative effects assessment for the issuance or reissuance of a general permit is to include an evaluation of “the number of individual discharge activities likely to be regulated under a general permit until its expiration, including repetitions of individual discharge activities at a single location.” [40 CFR 230.7(b)(3)] If a situation arises in which cumulative effects are likely to be more than minimal and the proposed activity requires further review, or is more appropriately reviewed under the individual permit process, provisions of the NWPs allow division and/or district engineers to take such action.

Based on reported use of this NWP during the period of March 19, 2012, to March 12, 2015, the Corps estimates that this NWP will be used approximately 325 times per year on a national basis, resulting in impacts to approximately 11,250 acres of waters of the United States. The reported use includes pre-construction notifications submitted to Corps districts, as required by the terms and conditions of the NWP as well as regional conditions imposed by division engineers. The reported use also includes voluntary notifications to submitted to Corps districts where the applicants request written verification in cases when pre-construction notification is not required. The reported use does not include activities that do not require pre-construction notification and were not voluntarily reported to Corps districts. The Corps estimates that 50 NWP 48 activities will occur each year that do not require pre-construction notification, and that these activities will impact 150 acres of jurisdictional waters each year.

Based on reported use of this NWP during that time period, the Corps estimates that no NWP 48 verifications will require compensatory mitigation to offset the authorized impacts to waters of the United States and ensure that the authorized activities resulted in only minimal adverse effects on the aquatic environment. The verified activities that do not require compensatory mitigation will have been determined by Corps district engineers to result in no more than minimal individual and cumulative adverse effects on the aquatic environment without compensatory mitigation. During 2017-2022, the Corps expects little change to the percentage of NWP 48 verifications requiring compensatory mitigation, because there have been no substantial changes in the mitigation general condition or the NWP regulations for determining when compensatory mitigation is to be required for NWP activities. The Corps estimates that no compensatory mitigation will be required to offset these impacts. The demand for these types of activities could increase or decrease over the five-year duration of this NWP.

Based on these annual estimates, the Corps estimates that approximately 1,625 activities could be authorized over a five year period until this NWP expires, resulting in impacts to approximately 56,250 acres of waters of the United States, including jurisdictional wetlands. No compensatory mitigation will be required to offset those impacts. Compensatory mitigation is the restoration (re-establishment or rehabilitation), establishment, enhancement, and/or in certain circumstances preservation of aquatic resources for the purposes of offsetting unavoidable adverse impacts which remain after all appropriate and

practicable avoidance and minimization has been achieved. [33 CFR 332.2]

Wetland restoration, enhancement, and establishment projects can provide wetland functions, as long as the wetland compensatory mitigation project is placed in an appropriate landscape position, has appropriate hydrology for the desired wetland type, and the watershed condition will support the desired wetland type (NRC 2001). Site selection is critical to find a site with appropriate hydrologic conditions and soils to support a replacement wetland that will provide the desired wetland functions and services (Mitsch and Gosselink 2015). The ecological performance of wetland restoration, enhancement, and establishment is dependent on practitioner's understanding of wetland functions, allowing sufficient time for wetland functions to develop, and allowing natural processes of ecosystem development (self-design or self-organization) to take place, instead of over-designing and over-engineering the replacement wetland (Mitsch and Gosselink (2015). Most studies of the ecological performance of compensatory mitigation projects have focused solely on the ecological attributes of the compensatory mitigation projects, and few studies have also evaluated the aquatic resources impacted by permitted activities (Kettlewell et al. 2008), so it is difficult to assess whether compensatory mitigation has fully or partially offset the lost functions provided by the aquatic resources that are impacted by permitted activities. In its review, the NRC (2001) concluded that some wetland types can be restored or established (e.g., non-tidal emergent wetlands, some forested and scrub-shrub wetlands, sea grasses, and coastal marshes), while other wetland types (e.g., vernal pools, bogs, and fens) are difficult to restore and should be avoided where possible. Restored riverine and tidal wetlands achieved wetland structure and function more rapidly than depressional wetlands (Moreno-Mateos et al. 2012). Because of its greater potential to provide wetland functions, restoration is the preferred compensatory mitigation mechanism (33 CFR 332.3(a)(2)). Bogs, fens, and springs are considered to be difficult-to-replace resources and compensatory mitigation should be provided through in-kind rehabilitation, enhancement, or preservation of these wetlands types (33 CFR 332.3(e)(3)).

In its review of outcomes of wetland compensatory mitigation activities, the NRC (2001) stated that wetland functions can be replaced by wetland restoration and establishment activities. They discussed five categories of wetland functions: hydrology, water quality, maintenance of plant communities, maintenance of animal communities, and soil functions. Wetland functions develop at different rates in wetland restoration and establishment projects (NRC 2001). It is difficult to restore or establish natural wetland hydrology, and water quality functions are likely to be different than the functions provided at wetland impact sites (NRC 2001). Reestablishing or establishing the desired plant community may be difficult because of invasive species colonizing the mitigation project site (NRC 2001). The committee also found that establishing and maintaining animal communities depends on the surrounding landscape. Soil functions can take a substantial amount of time to develop, because they are dependent on soil organic matter and other soil properties (NRC 2001). The NRC (2001) concluded that the ecological performance in replacing wetland functions depends on the particular function of interest, the restoration or establishment techniques used, and the extent of degradation of the compensatory mitigation project site and its watershed.

The ecological performance of wetland restoration and enhancement activities is affected by the amount of changes to hydrology and inputs of pollutants, nutrients, and sediments within the watershed or contributing drainage area (Wright et al. 2006). Wetland restoration is becoming more effective at replacing or improving wetland functions, especially in cases where monitoring and adaptive management are used to correct deficiencies in these efforts (Zedler and Kercher 2005). Wetland functions take time to develop after the restoration or enhancement activity takes place (Mitsch and Gosselink 2015, Gebo and Brooks 2012), and different functions develop at different rates (Moreno-Mateos 2012). Irreversible changes to landscapes, especially those that affect hydrology within contributing drainage areas or watersheds, cause wetland degradation and impede the ecological performance of wetland restoration efforts (Zedler and Kercher 2005). Gebo and Brooks (2012) evaluated wetland compensatory mitigation projects in Pennsylvania and compared them to reference standards (i.e., the highest functioning wetlands in the study area) and natural reference wetlands that showed the range of variation due to human disturbances. They concluded that most of the wetland mitigation sites were functioning at levels within with the range of functionality of the reference wetlands in the region, and therefore were functioning at levels similar to some naturally occurring wetlands. The ecological performance of mitigation wetlands is affected by on the landscape context (e.g., urbanization) of the replacement wetland and varies with wetland type (e.g., riverine or depressional) (Gebo and Brooks 2012). Moreno-Mateos and others (2012) conducted a meta-analysis of wetland restoration studies and concluded that while wetland structure and function can be restored to a large degree, the ecological performance of wetland restoration projects is dependent on wetland size and local environmental setting. They found that wetland restoration projects that are larger in size and in less disturbed landscape settings achieve structure and function more quickly.

Streams are difficult-to-replace resources and compensatory mitigation should be provided through stream rehabilitation, enhancement, and preservation since those techniques are most likely to be ecologically successful (see 33 CFR 332.3(e)(3)). Stream rehabilitation is usually the most effective compensatory mitigation mechanism since restoring a stream to a historic state is not possible because of changes in land use and other activities in a watershed (Roni et al. 2008). Stream rehabilitation and enhancement projects, including the restoration and preservation of riparian areas, provide riverine functions (e.g., Allan and Castillo (2007) for rivers and streams, NRC (2002) for riparian areas). Improvements in ecological performance of stream restoration projects is dependent on the restoration method and how outcomes are assessed (Palmer et al. 2014). Non-structural and structural techniques can be used to rehabilitate and enhance streams, and restore riparian areas (NRC 1992). Non-structural practices include removing disturbances to allow recovery of stream and riparian area structure and function, reducing or eliminating activities that have altered stream flows to restore natural flows, preserving or restoring floodplains, and restoring and protecting riparian areas, including fencing those areas to exclude livestock and people (NRC 1992). Structural rehabilitation and enhancement techniques include dam removal, as well as channel, bank, and/or riparian area modifications to improve river and stream habitat (NRC 1992).

The restoration and enhancement of river and stream functions and services can be improved through a variety of techniques and in many cases combinations of these techniques are used

(Roni et al. 2013). Examples of stream restoration and enhancement techniques include: dam removal and modification, culvert replacement or modification, fish passage structures when connectivity cannot be restored or improved by dam removal or culvert replacement, levee removal or setbacks, reconnecting floodplains and other riparian habitats, road removal, road modifications, reducing sediment and pollution inputs to streams, replacing impervious surfaces with pervious surfaces, restoring adequate in-stream or base flows, restoring riparian areas, fencing streams and their riparian areas to exclude livestock, improving in-stream habitat, recreating meanders, and replacing hard bank stabilization structures with bioengineering bank stabilization measures (Roni et al. 2013). Road improvements, riparian rehabilitation, reconnecting floodplains to their rivers, and installing in-stream habitat structures have had varying degrees of ecological performance in stream rehabilitation activities (Roni et al. 2008). The ecological performance of these stream rehabilitation activities is strongly dependent on addressing impaired water quality and insufficient water quantity, since those factors usually limit the biological response to stream rehabilitation efforts (Roni et al. 2008). Ecologically successful stream rehabilitation and enhancement activities depend on addressing the factors that most strongly affect stream functions, especially water quality, water flow, and riparian quality, and not focusing solely on rehabilitating or enhancing the physical habitat of streams (Palmer et al. 2010). The ability to restore the ecological functions of streams is dependent on the condition of the watershed draining to the stream being restored because human land uses and other activities in the watershed affect how that stream functions (Palmer et al. 2014). Stream restoration projects should focus on restoring ecological processes, such as dam removal, watershed best management practices, improving the riparian zone, and reforestation, instead of focusing on the manipulation the structure of the stream channel (Palmer et al. 2014).

For compensatory mitigation projects, restoration is the preferred mechanism (see 33 CFR 332.3(a)(2)). In an analysis of 89 ecosystem restoration projects, Rey Banayas et al. (2009) concluded that restoration activities can increase biodiversity and the level of ecosystem services provided. However, such increases do not approach the amounts of biodiversity and ecosystem services performed by undisturbed reference sites. The ability to restore ecosystems to provide levels of functions and services similar to historic conditions or reference standard conditions is influenced by human impacts to watersheds and other types of landscapes (e.g., urbanization, agriculture) and to the processes that sustain those ecosystems (Zedler et al. 2012, Hobbs et al. 2014). Those changes need to be taken into account when establishing goals and objectives for restoration projects (Zedler et al. 2012), including compensatory mitigation projects. The ability to reverse ecosystem degradation to restore ecological functions and services is dependent on the degree of degradation of that ecosystem and the surrounding landscape, and whether that degradation is reversible (Hobbs et al. 2014).

As discussed in section 3.0, the status of waters and wetlands in the United States as reported under the provisions of Sections 303(d) and 305(b) of the Clean Water Act exhibits considerable variation, ranging from good to threatened to impaired. One of the criteria that district engineers consider when they evaluate proposed NWP activities is the “degree or magnitude to which the aquatic resources perform these functions” (see paragraph 1 of Section D, “District Engineer’s Decision.” The quality of the affected waters is considered

by district engineers when making decisions on whether to require compensatory mitigation for proposed NWP activities to ensure no more than minimal adverse environmental effects (see 33 CFR 330.1(e)(3)), and amount of compensatory mitigation required (see 33 CFR 332.3(f)). The quality of the affected waters also factors into the determination of whether the required compensatory mitigation offsets the losses of aquatic functions caused by the NWP activity.

The compensatory mitigation required by district engineers in accordance with general condition 23 and activity-specific conditions will provide aquatic resource functions and services to offset some or all of the losses of aquatic resource functions caused by the activities authorized by this NWP, and reduce the contribution of those activities to the cumulative effects on the Nation's wetlands, streams, and other aquatic resources. The required compensatory mitigation must be conducted in accordance with the applicable provisions of 33 CFR part 332, which requires development and implementation of approved mitigation plans, as well as monitoring to assess ecological success in accordance with ecological performance standards established for the compensatory mitigation project. The district engineer will evaluate monitoring reports to determine if the compensatory mitigation project has fulfilled its objectives and is ecological successful. [33 CFR 332.6] If the monitoring efforts indicate that the compensatory mitigation project is failing to meet its objectives, the district engineer may require additional measures, such as adaptive management or alternative compensatory mitigation, to address the compensatory mitigation project's deficiencies. [33 CFR 332.7(c)]

According to Dahl (2011), during the period of 2004 to 2009 approximately 489,620 acres of former upland were converted to wetlands as a result of wetland reestablishment and establishment activities. Efforts to reestablish or establish wetlands have increased wetland acreage in the United States.

The individual and cumulative adverse effects on the aquatic environment resulting from the activities authorized by this NWP will be no more than minimal. The Corps expects that the convenience and time savings associated with the use of this NWP will encourage applicants to design their projects within the scope of the NWP, including its limits, rather than request individual permits for projects that could result in greater adverse impacts to the aquatic environment. Division and district engineers will restrict or prohibit this NWP on a regional or case-specific basis if they determine that these activities will result in more than minimal individual and cumulative adverse effects on the aquatic environment.

7.2.3 Section 404(b)(1) Guidelines Impact Analysis, Subparts C through F

(a) Substrate: Discharges of dredged or fill material into waters of the United States will alter the substrate of those waters, usually by altering the composition of the substrate to make it more suitable for shellfish reproduction and growth. The discharges of dredged or fill material authorized by this NWP will not replace aquatic areas with dry land. There may be changes to the physical, chemical, and biological characteristics of the substrate. The original substrate may be removed or covered by other material, such as sand or gravel.

(b) Suspended particulates/turbidity: Depending on the method of operation, including harvesting techniques, sediment control measures, equipment, composition of the bottom substrate, and wind and current conditions during these activities, there may be temporary increases in water turbidity. Pre-construction notification is required for certain activities authorized by this NWP, which will allow the district engineer to review those activities and ensure that adverse effects on the aquatic environment are no more than minimal. Particulates will be temporarily resuspended in the water column during harvesting and other commercial shellfish aquaculture activities. The turbidity plume will normally be limited to the immediate vicinity of the disturbance and should dissipate shortly after each phase of operation. NWP activities cannot create turbidity plumes that smother important spawning areas downstream (see general condition 3).

(c) Water: Commercial shellfish aquaculture activities can affect some characteristics of water, such as water clarity, chemical content, dissolved gas concentrations, pH, and temperature. Changes in water quality can affect the species and quantities of organisms inhabiting the aquatic area, and the activities authorized by this NWP will usually have beneficial effects on water quality. Water quality certification is required for activities authorized by this NWP that involve discharges of dredged or fill material into waters of the United States, which will ensure that the activities do not violate applicable water quality standards. Permittees may be required to implement water quality management measures, including best management practices, to ensure that the authorized activities do not result in more than minimal degradation of water quality.

(d) Current patterns and water circulation: Activities authorized by this NWP will have minor adverse effects on the movement of water in the aquatic environment. Certain activities authorized by this NWP require pre-construction notification to the district engineer, which will help ensure that adverse effects to current patterns and water circulation are no more than minimal. General condition 9 requires the authorized activity to be designed to withstand expected high flows and to maintain the course, condition, capacity, and location of open waters to the maximum extent practicable.

(e) Normal water level fluctuations: The activities authorized by this NWP will not adversely affect normal patterns of water level fluctuations due to tides and flooding, since it authorizes only commercial shellfish aquaculture activities, which occur in open waters and do not replace aquatic areas with dry land. General condition 9 requires the permittee to maintain the pre-construction course, condition, capacity, and location of open waters, to the maximum extent practicable.

(f) Salinity gradients: The activities authorized by this NWP will not have adverse effects on salinity gradients, since commercial shellfish aquaculture activities utilize existing waters and do not change salinity.

(g) Threatened and endangered species: The NWPs do not authorize activities that will jeopardize the continued existence of species listed as endangered or threatened under the Endangered Species Act of 1973, as amended. In addition, the NWPs do not authorize activities that will destroy or adversely modify critical habitat of those species. See 33 CFR

330.4(f) and paragraph (a) of general condition 18. For NWP activities, compliance with the Endangered Species Act is discussed in more detail in section 6.0 of this document.

(h) Fish, crustaceans, molluscs, and other aquatic organisms in the food web. Certain activities authorized by this NWP require pre-construction notification to the district engineer, which will allow review of those activities to ensure that adverse effects to fish and other aquatic organisms in the food web are no more than minimal. Fish and other motile animals may avoid the project site while aquaculture activities such as site preparation, transplantation, and harvesting are conducted. Sessile or slow-moving animals in the path of discharges of dredged or fill material and aquaculture equipment may be destroyed. Some aquatic animals may be smothered by the placement of fill material. Some aquatic organisms will inhabit the physical structure created by equipment used for commercial shellfish aquaculture activities (Dumbauld et al. 2009). Motile animals will return to those areas that are temporarily impacted by the activity and restored or allowed to revert back to pre-construction conditions. Shellfish production will increase as a result of the activities authorized by this NWP.

Division and district engineers can place conditions on this NWP to prohibit discharges during important stages of the life cycles of certain aquatic organisms. Such time of year restrictions can prevent adverse effects to these aquatic organisms during reproduction and development periods. General conditions 3 and 5 address protection of spawning areas and shellfish beds, respectively. General condition 3 states that activities in spawning areas during spawning seasons must be avoided to the maximum extent practicable. In addition, general condition 3 also prohibits activities that result in the physical destruction of important spawning areas. General condition 5 prohibits activities in areas of concentrated shellfish populations, except for activities authorized by NWPs 4 and 48.

(i) Other wildlife: Activities authorized by this NWP will result in negligible adverse effects on other wildlife associated with aquatic ecosystems, such as resident and transient fish, since the NWP authorizes only commercial shellfish aquaculture activities. This NWP does not authorize activities that jeopardize the continued existence of Federally-listed endangered and threatened species or result in the destruction or adverse modification of critical habitat. General condition 4 states that activities in breeding areas for migratory birds must be avoided to the maximum extent practicable.

(j) Special aquatic sites: The potential impacts to specific special aquatic sites are discussed below:

(1) Sanctuaries and refuges: The activities authorized by this NWP will have only minimal adverse effects on waters of the United States within sanctuaries or refuges designated by Federal or state laws or local ordinances. District engineers will exercise discretionary authority and require individual permits for specific activities in waters of the United States in sanctuaries and refuges if those activities will result in more than minimal adverse effects on the aquatic environment.

(2) Wetlands: The activities authorized by this NWP will have no more than minimal

adverse effects on wetlands, since these activities occur primarily in open waters. District engineers will review those NWP activities that require pre-construction notification to ensure that the adverse effects on the aquatic environment are no more than minimal. Division engineers can regionally condition this NWP to restrict or prohibit its use in certain high value wetlands. See paragraph (e) of section 5.1 for a more detailed discussion of impacts to wetlands.

(3) Mud flats: The activities authorized by this NWP will have no more than minimal adverse effects on mud flats, since the NWP authorizes only commercial shellfish aquaculture activities and those activities will usually only have temporary impacts on mud flats.

(4) Vegetated shallows: The activities authorized by this NWP will have no more than minimal adverse effects on vegetated shallows. While shellfish compete with seagrasses for space, shellfish benefit seagrasses by providing nutrients to sediments and the water column and by making the water clearer (Dumbauld and McCoy 2015). New commercial shellfish aquaculture activities (i.e., activities conducted in areas that have not been used for commercial shellfish aquaculture during the past 100 years) authorized by this NWP cannot directly affect more than 1/2-acre of submerged aquatic vegetation. District engineers will review pre-construction notifications to determine if those activities will result in only minimal adverse effects on the aquatic environment. If the vegetated shallows are high value and the proposed activity will result in more than minimal adverse effects on the aquatic environment, the district engineer will exercise discretionary authority to require the project proponent to obtain an individual permit. The presence of suspension feeding bivalve shellfish in estuarine and marine waters has been shown to help improve the productivity of species of submerged aquatic vegetation in those waters (e.g., Peterson and Heck 2001). Filter feeding bivalves remove suspended particles and plankton from the water column and often release nutrients to sediments, which may help increase seagrass production (Dumbauld et al. 2009). Dumbauld and McCoy (2015) found that oyster aquaculture impacts on seagrasses are temporary when examined at a landscape scale and that seagrasses recover fairly rapidly after mechanical disturbances by aquaculture activities. There are trade-offs between oyster aquaculture and eelgrass populations, and the effects of oyster aquaculture on eelgrass vary depending on the oyster cultivation techniques used (Tallis et al. 2009). Those trade-offs should be examined at a landscape scale, rather than a site scale because of the variability that occurs over time (Tallis et al. 2009).

(5) Coral reefs: The activities authorized by this NWP will have no more than minimal adverse effects on coral reefs. Division engineers may add regional conditions to this NWP if there is potential for the activities authorized by this NWP to have direct or indirect impacts on coral reefs.

(6) Riffle and pool complexes: The activities authorized by this NWP will have little or no adverse effects on riffle and pool complexes, since it is limited to commercial shellfish aquaculture activities in navigable waters.

(k) Municipal and private water supplies: See paragraph (n) of section 5.1 for a discussion of

potential impacts to water supplies.

(l) Recreational and commercial fisheries, including essential fish habitat: The activities authorized by this NWP will have minor adverse effects on waters of the United States that act as habitat for populations of economically important fish and shellfish species, since it authorizes commercial shellfish aquaculture activities. The activities authorized by this NWP will increase populations of shellfish in navigable waters, which will provide ecological functions and services associated with those organisms. Both eelgrass and oysters provide habitat for invertebrates that are important food sources for populations of fish and decapod crustaceans (Hosack et al. 2006). Division and district engineers can condition this NWP to prohibit discharges during important life cycle stages, such as spawning or development periods, of economically valuable fish and shellfish. Compliance with general conditions 3 and 5 will ensure that the authorized activities do not adversely affect important spawning areas or concentrated shellfish populations. As discussed in paragraph (g) of section 5.1, there are procedures to help ensure that individual and cumulative impacts to essential fish habitat are no more than minimal. For example, division and district engineers can impose regional and special conditions to ensure that activities authorized by this NWP will result in only minimal adverse effects on essential fish habitat.

(m) Water-related recreation: See paragraph (m) of section 5.1 above.

(n) Aesthetics: See paragraph (c) of section 5.1 above.

(o) Parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar areas: This NWP can be used to authorize activities in parks, national and historical monuments, national seashores, wilderness areas, and research sites if there are commercial shellfish aquaculture activities are authorized in those areas through leases, permits, treaties, or other legal instruments that establish enforceable property interests for growers, and those activities result in no more than minimal adverse effects on the aquatic environment. Division engineers can regionally condition the NWP to prohibit its use in designated areas, such as national wildlife refuges or wilderness areas.

8.0 Determinations

8.1 Finding of No Significant Impact

Based on the information in this document, the Corps has determined that the issuance of this NWP will not have a significant impact on the quality of the human environment. Therefore, the preparation of an Environmental Impact Statement is not required.

8.2 Public Interest Determination

In accordance with the requirements of 33 CFR 320.4, the Corps has determined, based on

the information in this document, that the issuance of this NWP is not contrary to the public interest.

8.3 Section 404(b)(1) Guidelines Compliance

This NWP has been evaluated for compliance with the 404(b)(1) Guidelines, including Subparts C through G. Based on the information in this document, the Corps has determined that the discharges authorized by this NWP comply with the 404(b)(1) Guidelines, with the inclusion of appropriate and practicable conditions, including mitigation, necessary to minimize adverse effects on affected aquatic ecosystems. The activities authorized by this NWP will result in no more than minimal individual and cumulative adverse effects on the aquatic environment.

8.4 Section 176(c) of the Clean Air Act General Conformity Rule Review

This NWP has been analyzed for conformity applicability pursuant to regulations implementing Section 176(c) of the Clean Air Act. It has been determined that the activities authorized by this permit will not exceed *de minimis* levels of direct emissions of a criteria pollutant or its precursors and are exempted by 40 CFR 93.153. Any later indirect emissions are generally not within the Corps continuing program responsibility and generally cannot be practicably controlled by the Corps. For these reasons, a conformity determination is not required for this NWP.

FOR THE COMMANDER

Dated: 21 Dec 2016

A handwritten signature in black ink, appearing to read 'Donald E. Jackson', with a long horizontal line extending to the right.

Donald E. Jackson
Major General, U.S. Army
Deputy Commanding General
for Civil and Emergency Operations

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