# National Flood Insurance Program

Biological Evaluation

Federal Emergency Management Agency
November 2016

## Version History

| Version | Date | Description |
|---|---|---|
| 1.0 | September 28, 2015 | Draft Biological Evaluation provided to USFWS and NMFS. |
| 2.0 | December 28, 2015 | Revised to identify Distinct Population Segment (DPS) species in Table 4-3, Table 4-4, Table 4-5, Table 4-6, and Table 4-7 and Evolutionary Significant Unit (ESU) species in Table 4-7. |
| 3.0 | July 1, 2016 | Revised for changes in the Proposed Action. |

# National Flood Insurance Program (NFIP)
# Biological Evaluation (BE)
# November 2016

## EXECUTIVE SUMMARY

### ES-1 Introduction and Background

Established by Congress with the passage of the National Flood Insurance Act of 1968 and administered by the Federal Emergency Management Agency (FEMA), the National Flood Insurance Program (NFIP) is a voluntary Federal program through which property owners in participating communities can purchase Federal flood insurance as a protection against flood losses. In exchange, communities must enact local floodplain management regulations to reduce flood risk and flood-related damages. However, the power to regulate floodplain development, including requiring and approving permits, inspecting property, and citing violations, requires land use authority. The regulation of land use falls under the State's police powers, which the Constitution reserves to the States, and the States delegate this power down to their respective political subdivisions. FEMA has no direct involvement in the administration of local floodplain management ordinances.

In addition to providing flood insurance and reducing flood damages through floodplain management, the NFIP identifies and maps the nation's floodplains. Maps depicting flood hazard information are used to promote broad-based awareness of flood hazards, provide data for rating flood insurance policies, and determine the appropriate minimum floodplain management criteria for flood hazard areas.

Since 2012, FEMA has coordinated with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS or National Oceanic and Atmospheric Administration [NOAA] Fisheries) on developing a nationwide approach to Section 7 compliance for the NFIP. In accordance with Section 7(a)(2) of the Endangered Species Act (ESA), all Federal agencies are required to consult with USFWS and NMFS—collectively referred to as "the Services"—to ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of a threatened or endangered species, or result in the destruction or adverse modification of designated critical habitat.

FEMA has prepared this Biological Evaluation (BE) pursuant to Section 7 of the ESA to evaluate the potential effects of the Proposed Action, which is the current implementation of the NFIP, as modified by recent legislation and other proposed program changes, on ESA-listed species and designated critical habitats within floodplains across the nation. This BE also evaluates the potential effects of the Proposed Action on designated Essential Fish Habitat (EFH) defined under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) in a separate EFH Assessment (Chapter 5).

### ES-2 Proposed Action

The Proposed Action, which is discussed in detail in Sections 2.1 to 2.3, is the current implementation of the NFIP, as modified by recent legislation and other proposed program changes. The three elements of the Proposed Action that FEMA is evaluating are Floodplain Management, Flood Hazard Mapping, and Flood Insurance.

Participation in the NFIP is based on a voluntary agreement between FEMA and the participating communities. If a community adopts and enforces a floodplain management ordinance that meets certain minimum requirements to reduce future flood risks within an area known as the Special

Flood Hazard Area, or SFHA, FEMA will make flood insurance available to property owners in that community. In addition to providing flood insurance and reducing flood damages through floodplain management, FEMA identifies and maps the nation's floodplains. The three main components to the NFIP are Flood Insurance, Floodplain Management, and Flood Hazard Mapping.

### ES-2.1 Flood Insurance

The NFIP makes Federal flood insurance available to property owners or lessees in communities that participate in the NFIP. Through the NFIP, property owners in participating communities are able to insure their property against future flood losses. The availability of flood insurance can build local self-sufficiency and promote sustainable, disaster resilient, and even disaster-resistant communities.

As originally established, the National Flood Insurance Act of 1968 (NFIA) authorized FEMA to provide subsidized flood insurance only for existing buildings or buildings built prior to the community's first Flood Insurance Rate Map (FIRM) (generally referred to as "pre-FIRM buildings." This means that flood insurance for new development has never been subsidized by the NFIP (subject to the very limited, short-term exceptions established in 42 United States Code (U.S.C.) § 4014(e)-(f)).

However, subject to the very limited, short term statutory exceptions referenced above, FEMA must apply actuarial rates to all buildings constructed, or substantially damaged or improved, on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later (generally referred to as "post-FIRM buildings").(42 U.S.C. §§ 4014(a)(1), 4015(b)).

As discussed in the Program Changes (Section ES-2.4), with the passage of the Biggert Waters Flood Insurance Reform Act of 2012 and the Homeowner Flood Insurance Affordability Act of 2014, FEMA is required to phase out the subsidies on pre-FIRM properties. Some subsidies must be phased out immediately, some will be phased out at a rate of 25% premium rate increases per year, and the rest will be phased out at a rate of 5-15% premium rate increases per year. Accordingly, when this phase out is completed, FEMA will not offer subsidized flood insurance for either new or existing floodplain development (subject to certain limited, short term statutory exceptions). As such, the premium rates on NFIP policies will be comparable to the premium rates offered on the private flood insurance market.

### ES-2.2 Floodplain Management

A local community with land use authority elects to participate in the NFIP. In order to participate in the NFIP, a community must adopt and enforce floodplain management regulations that incorporate the NFIP minimum floodplain management criteria (44 C.F.R. §§ 59.2(b), 59.22(a)(3), 60.1(d)). The purpose of these standards is to reduce flood risk and prevent loss of life and property. Communities incorporate these requirements into their zoning codes, subdivision ordinances, and building codes, or they adopt special purpose floodplain management ordinances. These NFIP requirements apply to areas mapped as SFHAs in participating communities.

Under FEMA's regulations, participating NFIP communities are required to apply the minimum floodplain management criteria to all new development in the SFHA, including any buildings that are substantially damaged or improved (44 C.F.R. § 60.3). However, FEMA has no role in reviewing permit applications or issuing permits at the community level. Because FEMA is not authorized by statute to act as a permitting authority, the NFIP floodplain management criteria are administered by States and communities through their floodplain management regulations. FEMA's role is limited to programmatic monitoring, oversight, and technical assistance to ensure

that communities are implementing and enforcing the minimum floodplain management criteria (see 42 U.S.C. § 4102(c); 40 U.S.C. § 4022(a)(1)). A community that fails to adequately enforce its floodplain management ordinances may be put on probation or suspended from the NFIP (see 44 C.F.R. §§ 59.24(b) and (c)).

### ES-2.3 Flood Hazard Mapping

Through its Flood Hazard Mapping Program, FEMA identifies flood hazards, assesses flood risks, and collaborates with States and communities to provide accurate flood hazard and risk data to guide them to mitigation actions. Congress requires FEMA to identify flood-prone areas and subdivide them into flood risk zones to provide the data that is used to administer community floodplain management regulations and rate flood insurance policies. Mapping of flood hazards also promotes public awareness of the degree of hazard within such areas and provides for the expeditious identification and dissemination of flood hazard information. FEMA maintains and updates data through FIRMs and Flood Insurance Studies (FISs).

### ES-2.4 Program Changes

As stated above, the Proposed Action is the current implementation of the NFIP, as modified by recent legislation and proposed program changes. These program changes are as follows:

(a) Changes to Floodplain Management:
  (i) Clarify that pursuant to 44 C.F.R. § 60.3(a)(2), a community must obtain and maintain documentation of compliance with the appropriate Federal or state laws, including the ESA, as a condition of issuing floodplain development permits.

(b) Changes to Flood Hazard Mapping:
  (i) Clarify that certain letter of map change requests will not be issued until the community or project proponent has submitted documentation of compliance with the ESA.

(c) Changes to Flood Insurance:
  (i) Phase out of subsidies on certain pre-FIRM properties (non-primary residences, business properties, severe repetitive loss properties, substantially damaged or improved properties, and properties for which the cumulative claims payments exceed the fair market value of the property) at a rate of 25 percent premium rate increases per year.

  (ii) Phase out of subsidies on all other pre-FIRM properties through annual premium rate increases of an average rate of at least 5 percent, but no more than 15 percent, per risk classification, with no individual policy exceeding an 18 percent premium rate increase.

  (iii) Development of a monthly installment plan payment option for non-escrowed flood insurance premiums.

## ES-3 Outside the Scope of the Proposed Action

Floodplain development is not an action under the NFIP. As discussed in Section 2.3.2 below, Section 7 applies to actions that are authorized, funded, or carried out by a Federal agency. Floodplain development is not authorized, funded, or carried out by FEMA (except with respect to certain grant programs outside the scope of this evaluation). Furthermore, FEMA has no role in the issuance, denial, or enforcement of individual permits, nor does it have the land use authority necessary to prescribe the types of development that may take place in the floodplain. As discussed above, the NFIP was designed so that floodplain management would be carried out

at the State and local levels, where land use authority resides. The community regulates floodplain development through locally issued floodplain development permits. The community has the authority to issue or deny floodplain development permits. Likewise, the community monitors compliance and enforcement of individual permits. Therefore, the issuance, denial, and enforcement of individual permits are also outside the scope of FEMA's evaluation since these are not actions taken under the NFIP. This is consistent with interpretations taken with respect to other applicable Federal laws, such as Executive Orders 11988 and 13690. In sum, FEMA has no compliance responsibilities under the ESA with respect to private floodplain development. FEMA is only evaluating those actions identified as FEMA's actions in Section ES-2.

## ES-4 Action Area

The extent of the Action Area for this BE is the limit of the jurisdictional boundaries of the NFIP participating communities, including those areas in the United States and its territories designated as SFHAs on a FIRM under the NFIP.[1] The FEMA-mapped SFHA is the area where the NFIP's floodplain management regulations must be enforced (Federal Emergency Management Agency, 2014b). The SFHA is defined as "the land within the floodplain subject to a 1 percent or greater chance of flooding in any given year," often referred to as the 100-year floodplain (44 C.F.R. § 59.1).

## ES-5 Discretion

Section 7 of the ESA applies where there is discretionary Federal involvement or control. As discussed in Section 2.1, the actions and program elements comprising the NFIP are a mix of direct mandates (providing little or no flexibility in implementation) and discretionary actions. Under Section 7(a)(2) of the ESA, Federal agencies are required to consult only if there is discretionary involvement or control: "…where the Federal agency lacks the discretion to influence the private action, consultation would be a meaningless exercise; the agency simply does not possess the ability to implement measures that inure to the benefit [of] the protected species" (50 C.F.R. § 402.03). Accordingly, per the requirements of the Services' ESA-implementing regulations, Section 7 consultations typically focus on the actions where a Federal agency has discretionary control over implementation of the action. In *National Wildlife Federation v. FEMA*, the court held that **the provision of flood insurance is a non-discretionary action for which "FEMA has no obligation to consult"** (National Wildlife Federation v. Federal Emergency Management Agency, 2004) (emphasis added).

However, in technical assistance meetings held prior to the initiation of this BE, the Services have advised FEMA that in practice, they look at the effects of both discretionary and non-discretionary actions when assessing the effects of a program on ESA-listed species and designated critical habitat. The Services further advised FEMA that they would consider any BE that only analyzed discretionary NFIP actions to be deficient. As such, FEMA has consented to assess the effects of all aspects of the program. However, in order to ensure that any recommended program changes are limited to areas in which FEMA has discretion to make changes for the purposes of ESA compliance, FEMA has identified which actions are discretionary and which actions are non-discretionary. Table ES-1 identifies elements of the NFIP and describes the individual components under each element that FEMA will be evaluating under the ESA and indicates where FEMA has discretion (where FEMA has the authority to make a decision) or no discretion (actions that are mandated by statute).

[1] This does not include Federal lands or properties subject to Section 1316 of the NFIA.

## ES-6 The NFIP and Floodplain Development

The NFIP is sometimes perceived, based on anecdotal evidence, as encouraging development in the floodplain. However, as discussed in Section 3.5, the studies and analysis in this BE demonstrate that development in the nation's floodplains is driven by numerous other factors. The primary factors influencing development are economic factors, including the availability of jobs; proximity to ports, and tourism and recreation; infrastructure; and proximity to natural resources and existing communities.

A history of the NFIP and the available data and studies demonstrate that the availability of flood insurance has proved a very poor incentive to develop in the floodplain. Prior to 1973, there were only 95,000 NFIP policies in force. Because of the lack of interest in purchasing flood insurance, Congress passed the Flood Disaster Protection Act of 1973, which required the purchase of flood insurance as a condition of receiving federally-backed loans and Federal assistance in SFHAs of participating communities. Even after 1973, flood insurance purchases were still low, so Congress passed the National Flood Insurance Reform Act of 1994, which required Federal agency lender regulators to develop regulations to direct their federally regulated lenders not to make, increase, extend, or renew any loan on applicable property unless flood insurance is purchased and maintained. However, the 1994 Reform Act has also not had a substantial impact in increasing flood insurance purchases.

A 2013 Congressional Research Service report suggested that only 18 percent of Americans in flood zone areas have flood insurance, indicating that factors other than flood insurance are driving individuals to develop in the floodplain. This report found that "despite the existence of this mandatory flood insurance purchase requirement, take-up rates for flood insurance have historically been low and the Federal government's exposure to uninsured property losses from flooding remains substantial. Many homeowners do not completely recognize or internalize their flood risk and are overly optimistic about the magnitude of the flood risk to which they are exposed. Consequently, the NFIP has not achieved the level of individual participation originally envisioned by Congress." (Congressional Research Service, 2013)

Moreover, although more than 22,000 communities participate in the NFIP, the level of policy uptake within those communities demonstrates that flood insurance availability is not a key driver of individual behavior. A 2006 American Institutes for Research (AIR) report provides a number of data points – provided in the text box to the right – on the level and concentration of NFIP policies within the States, territories, and participating communities demonstrating this point (American Institutes for Research - Monday et al., 2006). The 2006 AIR report conducted a substantial literature review concerned with the public's perceptions about low frequency/high damage events, such as flooding, also indicates that the NFIP and flood insurance does little to influence floodplain development (American Institutes for Research - Monday et al., 2006).

> The 2006 AIR report found that out of approximately 20,000 communities participating in the NFIP at the time of the report:
>
> • 3,452 communities had no flood insurance policies whatsoever;
>
> • Half of the communities had fewer than 10 flood insurance policies each, and 2/3 of the communities had fewer than 20 policies each;
>
> • Five states – California, Florida, Louisiana, New Jersey, and Texas - accounted for nearly 70% of all NFIP policies; and
>
> • Even within these five states, policies were often concentrated in certain areas. For example, Florida had 437 participating communities, but over half of the policies were concentrated in just 20 of those communities. (American Institutes for Research - Monday et al., 2006)

Looking more broadly to the link between the implementation of the NFIP generally and floodplain development, studies have not shown that there is any demonstrable connection. For example, the Government Accountability Office (GAO) analyzed floodplain development data both before

and after a community entered the NFIP. The GAO found that annual increases and decreases in new housing units generally paralleled the rise and decline of total housing units in the Nation and seemed to be more directly related to the state of the economy than the availability of flood insurance. (Government Accountability Office, 2016)

The AIR took a different approach and looked at floodplain development in areas where flood insurance is available compared to areas in which it is not available (e.g., Coastal Barrier Resources System [CBRS] units). In this study, AIR found that available evidence suggests many CBRS units have been developed, often quite extensively, despite the absence of NFIP flood insurance. The report noted that development appeared to result from a combination of State and local government incentives and market forces. The report further found that "market forces appear to be an increasingly potent source of developmental pressure on CBRS units as undeveloped coastal barrier land becomes increasingly scarce." (American Institutes for Research - Rosenbaum, W. and Boulware, G., 2006)

As reported in the FEMA Floodplain Management Losses Avoided Study, more than half (57 percent) of residential properties located in SFHAs were built prior to the inception of the NFIP. As such, it is clear that development has occurred, and would continue to occur, in the SFHA even in the absence of flood insurance. Thus, the research and empirical evidence demonstrate that the availability of flood insurance has very little effect on the motivation to develop the floodplain, which was already well established prior to the inception of the NFIP (Federal Emergency Management Agency, 2014d).

## ES-7 Effects Analysis

Section 7(a)(2) of the ESA requires all Federal agencies to consult with the Services to ensure that any action they fund, authorize, or carry out does not jeopardize the continued survival of any endangered or threatened species or adversely modify designated critical habitat. Section 7(a)(2) generally requires a Federal agency to conduct a biological assessment or evaluation to identify any endangered or threatened species that may be affected by the agency's action. There are three possible results of such an assessment: (a) a determination is that a project will have "no effect," positive or negative, on ESA-listed species and designated critical habitat; (b) a determination that the action "may affect, but is not likely to adversely affect" the species; and (c) a determination that the action "may affect, and is likely to adversely affect" the species. If the agency makes a determination that the Proposed Action has "no effect," then concurrence from the Services is not necessary and no further action is warranted. If the agency makes a determination that the Proposed Action "may affect, but is not likely to adversely affect" ESA-listed species and designated critical habitat, then coordination with the Services is required. If the Services concur with an agency's finding that an action "may affect but is not likely to adversely affect" the species, then the consultation is complete. However, if the Services do not concur with such a finding, then consultation continues. The Services then use the agency's biological assessment as the basis for developing a Biological Opinion that further analyzes the action's impact on species to determine if the Proposed Action would jeopardize ESA-listed species or adversely modify designated critical habitat. If jeopardy or adverse modification of critical habitat is found by the Services, the Services will suggest a "reasonable and prudent alternative" (RPA) to the Proposed Action that will allow the Federal agency to proceed without jeopardizing the continued survival of ESA-listed species (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 1998). FEMA has determined that the Proposed Action, and all of the components therein, will have no effect (NE) on ESA species, critical habitat, or EFH.

Table ES-1 summarizes FEMA's formal effects determinations for the Proposed Action. The effects determinations take into account instances where a species assigned to a primary habitat outside the Action Area may rely on a habitat within the Action Area to meet an important physical

or biological need. For example, the primary habitat for sea turtles is offshore marine waters, which are outside the Action Area. However, sea turtles nest on beaches, which are within the Action Area, and that is accounted for in the effects determination for the offshore marine reptiles sub-group.

**Table ES-1: Effects Determination for the Proposed Action's Indirect Effects on ESA-Listed/Proposed Species, Designated/Proposed Critical Habitat, and Designated EFH within the Action Area**

| NFIP Element | Proposed Action | | Discretion/ No Discretion | Effects Determination |
|---|---|---|---|---|
| | Existing Component | Modification | | |
| Floodplain Management | Implementing Minimum Floodplain Management Criteria | Clarify that pursuant to 44 C.F.R. § 60.3(a)(2), a community must obtain and maintain documentation of compliance with the appropriate Federal and State laws, including the ESA, as a condition of issuing floodplain development permits. | Discretion | NE |
| | Enroll Communities in the NFIP | No change | No discretion | NE |
| | Monitor Communities' Compliance with NFIP via Community Assistance Visits (CAVs)/Community Assistance Contacts (CACs) | No change | Discretion | NE |
| | Enforcement (e.g., probation, suspension, Community Rating System (CRS) retrogrades) | No change | Discretion | NE |
| | Administer the Map Adoption Process | No change | No discretion | NE |
| | Administer CRS (includes awarding points for CRS Class ratings) | No change | Discretion | NE |
| | CRS Activity Changes / Updates | No change | Discretion | NE |
| | Training / General Technical Assistance on Minimum Floodplain Management Criteria | No change | Discretion | NE |
| | Removal of Insurance Eligibility (pursuant to Section 1316) | No change | No discretion | NE |
| Flood Hazard Mapping | Decision to publish Flood Insurance Rate Maps (FIRMs)– decision on level of study performed | No change | Discretion | NE |
| | Development of New or Revised Flood Insurance Studies (FIS) and SFHA Maps | No change | No discretion | NE |

| | | | | |
|---|---|---|---|---|
| | – making an FIS, engineering analysis | | | |
| | Non-regulatory Products and Features | No change | Discretion | NE |
| | Map Sequencing | No change | Discretion | NE |
| | Letter of Map Amendment (LOMA) and Letter of Determination Review (LODR) | No change | No discretion | NE |
| | Letter of Map Revision (LOMR) and Letter of Map Revision Based on Fill (LOMR-F) | Clarify that certain letter of map change requests will not be issued until the community or project proponent has submitted documentation of compliance with the ESA. | No discretion | NE |
| | Conditional Letter of Map Revision (CLOMR) | No change | Discretion | NE |
| | Conditional Letter of Map Revision Based on Fill (CLOMR-F) | No change | Discretion | NE |
| | Conditional Letter of Map Amendment (CLOMA) | No change | Discretion | NE |
| | Data Development and Dissemination | No change | Discretion | NE |
| | Community Outreach, Training, and General Technical Assistance | No change | Discretion | NE |
| | Implementing Mapping Standards, Policies, and Regulations | No change | Discretion | NE |
| | Levee Accreditation Process | Associated levee construction, maintenance, repair, etc. would be covered by the new LOMR/LOMR-F requirements. | No discretion | NE |
| | AR Zone-A99 Determinations | Associated levee construction, maintenance, repair, etc. would be covered by the new LOMR/LOMR-F requirements. | No discretion | NE |
| Flood Insurance | Administering the Provision of Flood Insurance | | | |
| | Administer Write Your Own (WYO ) Programs | No change | No discretion | NE |
| | Develop and Publish Insurance Rate Tables | • Subsidies on certain pre-FIRM properties (non-primary residences, business properties, severe repetitive loss properties, substantially damaged or improved properties, and properties for which the cumulative claims payments exceed the fair market value of the property) would be phased out at a rate of 25% premium rate increases per year.[1] | No discretion | NE |

| | | | | |
|---|---|---|---|---|
| | | • Subsidies on all other pre-FIRM properties would be phased out through annual premium rate increases of at least 5%, but no more than 15%, per risk classification, with no individual policy exceeding an 18% premium rate increase.[1] | | |
| | Insurance Policy Management (Issue / Sell / Renew / Refund / Appeal) | A monthly installment plan payment option for non-escrowed flood insurance premiums would be developed.[1] | No discretion | NE |
| | Educate Insurance Agents | No change | Discretion | NE |
| | Educate and Certify Claims Adjusters | No change | Discretion | NE |
| | Adjust Loss Claims | No change | No discretion | NE |
| | Pay Valid Claims | No change | No discretion | NE |
| | Provide General Technical Assistance | No change | Discretion | NE |
| | Marketing | No change | Discretion | NE |
| NE | No effect | | | |
| 1 | Modifications required by statute | | | |

## ES-8 Cumulative Effects

According to the ESA, cumulative effects are effects of future State or private actions not involving Federal actions, that are reasonably certain to occur within the Action Area of the Federal action subject to consultation (50 C.F.R. § 402.02). An assessment of cumulative effects occurs when the combined effects of an action are added to, or interact with, other effects in a particular place and within a particular timeframe.

For the purposes of this BE, reasonably foreseeable future actions are those State, Tribal, and local development projects in SFHAs nationwide likely to occur within the next 20 to 30 years.

Because there are more than 22,000 NFIP-participating communities within the nationwide Action Area, these future effects cannot be reasonably quantified. This BE addresses these effects by describing:

- The Effects Determination for the Proposed Action on ESA species, designated critical habitats, and EFH (Section 6.1);
- Interdependent and interrelated actions (Section 6.2); and
- Cumulative effects (Section 6.3).

Cumulative effects occurring in floodplains could include the indirect effects of the Proposed Action, combined with private floodplain development activities across the nation initiated by State agencies or local jurisdictions, Tribal entities, or private landowners. Activities could range from residential and business development to expansion and construction of new infrastructure, such as buildings, roads, utilities, or water-related projects (i.e., irrigation withdrawals, bank protection, and general land clearing). These factors may inevitably affect surface waters and terrestrial and aquatic habitats. Across the nation, there are a number of State, local, and Tribal efforts to reduce

and minimize ongoing cumulative effects to ESA species, designated critical habitats, and EFH to restore habitats, provide greater protection, and apply increasingly stringent water-related regulations.

While it is reasonably foreseeable that there will be private floodplain development in the Action Area within the next 20 to 30 years, the extent and the impacts of such development is not reasonably foreseeable. There are a number of other factors affecting ESA-listed species within the timeframe of the Proposed Action – such as invasive species, disease, predation, hunting and fishing, overexploitation, and climate change (discussed in detail in Section 3.5) – that make it very difficult to determine what effects to ESA-listed species are properly attributable to private floodplain development, even if the extent of such development were somehow ascertainable. This complication is exacerbated by the fact that the factors themselves are also difficult to quantify.

## ES-9 Conclusions

Based on a review of the current status of ESA-listed species and designated critical habitat, the environmental baseline for the Action Area, the effects of the Proposed Action, and cumulative effects, FEMA has determined that the Proposed Action will have no effect on species listed as threatened or endangered under the ESA or on the designated critical habitat of such species. FEMA has also determined that the Proposed Action will not reduce the quality or quantity of EFH, as defined under the MSA.

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## Acronyms

| ACRONYM | DEFINITION |
|---|---|
| **AIR** | American Institutes for Research |
| **ASFPM** | Association of State Floodplain Managers |
| **BE** | Biological Evaluation |
| **BFE** | Base Flood Elevation |
| **CATEX** | Categorical Exclusion |
| **CACs** | Community Assistance Contacts |
| **CAVs** | Community Assistance Visits |
| **CBRA** | Coastal Barrier Resources Act |
| **CBRS** | Coastal Barrier Resources System |
| **CEC** | Commission for Environmental Cooperation |
| **C.F.R.** | Code of Federal Regulations |
| **C-HAPC** | Coral Habitat Areas of Particular Concern |
| **CLOMA** | Conditional Letter of Map Amendment |
| **CLOMC** | Conditional Letter of Map Change |
| **CLOMR** | Conditional Letter of Map Revision |
| **CLOMR-F** | Conditional Letter of Map Revision Based On Fill |
| **CNMS** | Coordinated Needs Management System |
| **CRS** | Community Rating System |
| **CWA** | Clean Water Act |
| **CZM** | Coastal Zone Management |
| **DPS** | Distinct Population Segment |
| **EA** | Environmental Assessment |
| **ECOS** | Environmental Conservation Online System |
| **EEZ** | Exclusive Economic Zone |
| **EFH** | Essential Fish Habitat |
| **EHP** | Environmental Planning and Historic Preservation |
| **EIS** | Environmental Impact Statement |
| **EO** | Executive Order |
| **EPA** | Environmental Protection Agency |
| **ESA** | Endangered Species Act |

| ACRONYM | DEFINITION |
|---|---|
| **ESU** | Evolutionarily Significant Unit |
| **FEMA** | Federal Emergency Management Agency |
| **FFRMS** | Federal Flood Risk Management Standard |
| **FIRM** | Flood Insurance Rate Map |
| **FIS** | Flood Insurance Study |
| **FONSI** | Finding of No Significant Impact |
| **GAO** | Government Accountability Office |
| **GAP** | Gap Analysis Program |
| **GDP** | Gross Domestic Product |
| **HAPC** | Habitat Areas of Particular Concern |
| **HCP** | Habitat Conservation Plan |
| **HFIAA** | Homeowner's Flood Insurance Affordability Act of 2014 |
| **IPaC** | Information, Planning, and Conservation System |
| **LAA** | Likely to Adversely Affect |
| **LODR** | Letter of Determination Review |
| **LOMA** | Letter of Map Amendment |
| **LOMC** | Letter of Map Change |
| **LOMR** | Letter of Map Revision |
| **LOMR-F** | Letter of Map Revision Based On Fill |
| **MOU** | Memorandum of Understanding |
| **MSA** | Magnuson-Stevens Fishery Conservation and Management Act |
| **NE** | No Effect |
| **NEPA** | National Environmental Policy Act of 1969 |
| **NFIA** | National Flood Insurance Act of 1968 |
| **NFIP** | National Flood Insurance Program |
| **NLAA** | Not Likely to Adversely Affect |
| **NMFS** | National Marine Fisheries Service |
| **NPDES** | National Pollutant Discharge Elimination System |
| **NOAA** | National Oceanic and Atmospheric Administration |
| **OPA** | Otherwise Protected Areas |
| **ORV** | Off-road Vehicles |

| ACRONYM | DEFINITION |
|---|---|
| **RPA** | Reasonable and Prudent Alternative |
| **SFHA** | Special Flood Hazard Area |
| **TFIA** | The Flood Insurance Agency |
| **TMAC** | Technical Mapping Advisory Council |
| **USACE** | United States Army Corps of Engineers |
| **U.S.C.** | United States Code |
| **USFWS** | United States Fish and Wildlife Service |
| **WNS** | White-Nose Syndrome |
| **WYO** | Write-Your-Own |

# 1 INTRODUCTION AND BACKGROUND

The National Flood Insurance Program (NFIP) is a Federal program established by Congress with the passage of the National Flood Insurance Act of 1968 (NFIA) and administered by the Federal Emergency Management Agency (FEMA). Congress created the NFIP to "provid[e] appropriate protection against the perils of flood losses" and to "minimiz[e] exposure of property to flood losses" (42 United States Code [U.S.C.] § 4001(c)). The NFIP is a voluntary program through which property owners in participating communities can purchase Federal flood insurance as a protection against flood losses. In exchange, communities must enact floodplain management regulations to reduce flood risk and flood-related damages. Providing NFIP flood insurance indemnifies property owners from flood losses and reduces the costs of disaster assistance. NFIP floodplain management requirements are designed to reduce future flood damages and reduce disaster assistance costs. The losses avoided through implementation of these requirements is estimated at $1.7 billion (B) (Federal Emergency Management Agency, 2014d). In addition to providing flood insurance and reducing flood damages through floodplain management, the NFIP identifies and maps the nation's floodplains. Maps depicting flood hazard information are utilized to promote broad-based awareness of flood hazards, provide data for rating flood insurance policies, and determine the appropriate minimum floodplain management criteria for flood-prone areas.

FEMA has no land use authority. The power to regulate floodplain development, including requiring and approving permits, inspecting property, and citing violations, requires land use authority. The regulation of land use falls under the State's police powers, which the Constitution reserves to the States, and the States delegate this power down to their respective political subdivisions. FEMA has no direct involvement in the administration of local floodplain management ordinances. The NFIP operates as a Federal-State-local partnership that depends on State statutes and regulations authorizing local governments to regulate floodplain development under the State's police powers to protect the health, safety, and general welfare of its citizens.

Today, more than 22,000 communities participate in the NFIP, with more than 5.6 million flood insurance policies in effect, providing over $1.2 trillion (T) in insurance coverage (Federal Emergency Management Agency, 2013). In 2011, FEMA Administrator Craig Fugate reported to the Senate Committee on Banking, Housing, and Urban Affairs that implementation of the NFIP is estimated to save the nation about $1.7B annually through avoided flood losses (Congressional Research Service, 2013).

## 1.1 Purpose

In accordance with Section 7(a)(2) of the Endangered Species Act (ESA), all Federal agencies are required to consult with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS or National Oceanic and Atmospheric Administration [NOAA] Fisheries), referred to as "the Services," regarding potential effects of their actions to federally-listed threatened or endangered species and designated critical habitats. The Federal agency must ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of a federally listed species, or result in the destruction or adverse modification of designated critical habitat. For FEMA, the Proposed Action evaluated in this Biological Evaluation (BE) is the implementation of the NFIP in the United States as modified by recent legislation and proposed program changes. FEMA has prepared this BE pursuant to Section 7 of the ESA for the purpose of evaluating the potential effects of the Proposed Action on ESA-listed species, designated critical habitats, and designated Essential Fish Habitat (EFH).

The Action Area for this BE is the limit of the jurisdictional boundaries of the NFIP participating communities, including those areas in the United States and its territories designated as Special Flood Hazard Areas (SFHAs) on FEMA's flood maps, and the nearshore marine waters[2] that may be affected by the Proposed Action. The SFHA is defined as "the land within the floodplain subject to a 1 percent or greater chance of flooding in any given year," often referred to as the 100-year floodplain (44 C.F.R. § 59.1). The 1 percent annual chance flood represents a magnitude and frequency with a statistical probability of being equaled or exceeded annually.

FEMA began discussions with the Services on January 23, 2012 for technical assistance on FEMA's ideas for a nationwide approach to Section 7 compliance for the NFIP. Since this initial meeting, FEMA and the Services have held numerous meetings on this topic, as well as on the proposed program changes. Appendix A provides an overview of the meetings and discussions held with the Services, as well as some of the related correspondence.

[2] Nearshore marine waters are defined here as waters within a few hundred feet of the shoreline.

# 2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

The Proposed Action evaluated on this BE is the implementation of the NFIP in the United States, as modified by recent legislation and proposed program changes. This section will first cover (1) a discussion of the Proposed Action, including the current implementation of the NFIP, as well as the proposed program changes to the NFIP; (2) a discussion of what is outside the scope of the Proposed Action; and (3) a description of the Action Area

## 2.1 Proposed Action (Part 1): Current Implementation of the National Flood Insurance Program

As detailed above, Congress created the NFIP to provide appropriate protection against the perils of flood losses and to minimize exposure of property to flood losses. Participation in the NFIP is based on a voluntary agreement between participating (local, tribal, and States) communities and the Federal government. If a community adopts and enforces a floodplain management ordinance that meets certain minimum requirements to reduce future flood risks within an area known as the Special Flood Hazard Area, or SFHA, the Federal government will make flood insurance available to property owners and lessees in that community.

This section briefly describes the three main components of the NFIP—Floodplain Management, Flood Hazard Mapping, and Flood Insurance. Appendix B provides a detailed description of the NFIP and actions undertaken by FEMA in implementing the NFIP.

### 2.1.1 Floodplain Management

A community's participation in the NFIP is voluntary. Participation is based on an agreement between communities and the Federal government. A "community" is a governmental body with the authority to "adopt and enforce floodplain management regulations for the areas within its jurisdiction." Eligible communities can include cities, villages, towns, townships, counties, parishes, States, and Indian tribes (44 C.F.R. § 59.1).

> Case Summary: NFIP Does Not Regulate Property Owners Directly
>
> In the case of City of Myrtle Beach v. Buchanan Motels, the City of Myrtle Beach sought a declaratory judgment that various Myrtle Beach businesses were out of compliance with NFIP floodplain management regulations: 2012 U.S. Dist. LEXIS 4913 (D. S.C., 2012). The court found that the minimum floodplain management regulations set out the standards that a community should enforce so that the community, as a whole, remains eligible for insurance under NFIP. The court held that Defendants, as individual businesses who own property in Myrtle Beach, cannot violate FEMA regulations to which only a "community" has voluntarily subjected itself.
>
> The court further held that although the NFIP regulations allow FEMA, in certain circumstances, to deny flood insurance coverage to property owners, this denial is based on a violation of State or local laws, regulations, or ordinances. In so holding, the court clarified that the NFIP does not regulate property owners directly and that only the NFIP communities are subject to the NFIP regulations.

FEMA has no land use authority. The power to regulate development in the floodplain, including requiring and approving permits, inspecting property, and citing violations requires land use authority. The regulation of land use falls under the State's police powers, which the Constitution reserves to the States, and the States delegate this power down to their respective political subdivisions. FEMA has no direct involvement in the administration of local floodplain management ordinances. The NFIP operates as a Federal-State-local partnership that depends on State statutes and regulations authorizing local governments to regulate floodplain development under the State's police powers to protect the health, safety, and general welfare of its citizens. The NFIP was designed so that floodplain management would be carried out at the State and local levels, where land use authority resides. For the most part, local governments bear the responsibility for protecting residents from flood hazards, working to reduce flood damage, and preserving floodplain functions and resources.

#### 2.1.1.1 Enroll Communities in the NFIP

The NFIP provides flood insurance coverage only in States and communities that adopt and enforce floodplain management measures that meet the minimum floodplain management criteria established by regulation. Communities must apply to participate, submit compliant floodplain management requirements, and meet other program requirements. FEMA has established processes to enroll communities in the NFIP and to ensure that eligible communities continue to meet program requirements.

States also have a role in the NFIP and many have established State floodplain management programs. Each State has designated an NFIP State Coordinating Agency as a point of contact for the NFIP. Generally, the State Coordinating Agency is the State environmental or natural resources agency or the State emergency management agency.

Many States have adopted floodplain management statutes and regulations; in addition, they have established and funded their own floodplain management programs. States must also have floodplain management regulations or executive orders in place that meet the minimum requirements of the NFIP for State-owned properties in SFHAs. Where a State requires that communities adopt more restrictive requirements than the NFIP minimum requirements, such as a more restrictive floodway or additional freeboard (requiring new construction to be elevated to a level 1 or more feet higher than the Base Flood Elevation (BFE)), the State requirements take precedence over the NFIP minimum floodplain management standards, as long as the State enforces these higher standards.

#### 2.1.1.2 Administer the Map Adoption Process

As discussed in more detail below, FEMA identifies and publishes flood hazards nationwide and periodically updates flood hazard data in support of the NFIP. This flood hazard data is provided to the communities in the form of a Flood Insurance Rate Map (FIRM) or Flood Insurance Study (FIS). The FIRM and FIS report provide States and communities with the information needed for land use planning so that the States and communities can take actions to reduce risk to floodplain development. Each time FEMA provides a community with additional flood hazard data, that community must adopt new floodplain management regulations, or amend existing regulations, to incorporate the new data. The community has six months to incorporate the new data or it will be immediately suspended from the NFIP. (44 C.F.R. §§ 59.24(a) and 60.13)

#### *2.1.1.3 Implementing Minimum Floodplain Management Criteria*

In order to participate in the NFIP, a community must adopt and enforce floodplain management regulation that meets the NFIP floodplain management criteria (44 C.F.R. § 59.2(b), 59.22(a)(3), 60.1(d), 60.3(a) through (f)).[3] The intent of these standards is to reduce flood risk and loss of life and property. Additionally, communities are allowed, and encouraged, to adopt floodplain management regulations that are more restrictive than the minimum criteria. Higher standards are designed to reduce flood damage and encourage better long-range management and use of flood-prone areas. In the absence of the minimum floodplain management criteria, much floodplain development would go largely unregulated except to the extent that the communities themselves voluntarily regulate it. Many communities had little or no floodplain management regulations in place prior to joining the NFIP.

[3] Appendix B, Section 1.3.2, provides a detailed description of the NFIP, including the minimum floodplain management criteria.

Through regulations, FEMA sets certain nationally applicable minimum floodplain management criteria related to reducing flood hazard risk in floodplain areas for all NFIP participating communities. These regulations are often implemented through guidance that clarifies and elaborates upon the minimum floodplain criteria requirements. The communities must incorporate these minimum floodplain management criteria into community ordinances and regulations as a condition of participation in the NFIP. Because FEMA has no land use authority, the floodplain management criteria are essentially performance standards. As such, FEMA cannot require the communities to prohibit development,[4] it can only place certain floodplain management-related conditions on how that development will be carried out.

> Example: The minimum floodplain management criteria do not require communities to prohibit development in the floodway, but they do require the community to ensure that development is done in such a manner that it does not result in an increase in flood heights (subject to certain limited exceptions discussed later in this document). There are a number of ways to meet this performance standard, including, but not limited to: (a) reducing the size of the proposed development; (b) demolishing existing development; (c) not developing; or (d) providing compensatory storage. Because FEMA has no land use authority, FEMA does not dictate how the performance standard is met.

Communities incorporate the floodplain management criteria into their zoning codes, subdivision ordinances, and building codes, or they adopt special purpose floodplain management ordinances. The floodplain management criteria apply to areas mapped as SFHAs. The community ordinances must also include effective enforcement provisions (44 C.F.R. § 59.2(b)). A community that fails to adequately enforce its floodplain management ordinance may be put on probation or suspended from the NFIP (44 C.F.R. § 59.24(b)-(c)).

FEMA is not authorized by statute to act as a permitting authority. Therefore, floodplain development is regulated at the community level through the community's floodplain management regulations and floodplain development permitting process. Before a property owner can undertake any development in the SFHA, they must obtain a permit from the community. The community is responsible for reviewing the proposed development to ensure compliance with their floodplain management ordinance and that all necessary permits have been received from Federal or State agencies from which approval is required. FEMA has no knowledge of any community-issued permits in the SFHA until subsequent community monitoring efforts occur.

Participating communities must apply the minimum floodplain management criteria to all new construction in the SFHA, as well as to existing buildings in the SFHA that have been substantially damaged or substantially improved. It is the community's responsibility to make substantial improvement or substantial damage determinations. If a community determines that the cost of any re-construction, rehabilitation, addition, or other improvements to a building equals or exceeds 50 percent of the market value of the building before the construction began, the building is considered a "substantial improvement." If a community determines that the cost of restoring a building equals or exceeds 50 of the market value of the building before the damage occurred, the building is considered "substantially damaged." (44 C.F.R. § 59.1)

[4] Notably, although some minimum floodplain management criteria do utilize the word "prohibit" (e.g., 60.3(d)(3)'s requirement to "prohibit all encroachments…"), this word was utilized for the purposes of clarity to the participating communities. A careful reading of the regulations reveals that these criteria are actually performance standards (e.g., "prohibit all encroachments…unless it has been demonstrated… that the proposed encroachment will not result in any increase in flood levels…"). As such, FEMA is not exceeding its legal authority by placing an outright prohibition on development.

FEMA's role under the NFIP is limited to enrolling communities in the NFIP, setting the minimum floodplain management criteria, providing programmatic monitoring and oversight, and provision of technical assistance to ensure that communities are complying with the NFIP program requirements, and enforcing the program requirements when there are issues of programmatic non-compliance by a participating community.

Example: FEMA's compliance monitoring and enforcement efforts are limited to instances of systemic programmatic compliance, as opposed to non-compliance of individual permits. For example, in 2014, FEMA conducted a CAV with Union County, South Dakota, and cited several programmatic compliance issues that needed to be resolved. These issues included a non-compliant ordinance; permitting of residential structures with the lowest floor built below the base flood elevation; lack of documentation related to the elevation of lowest floors in residential or non-residential structures; lack of documentation related to development in the regulatory floodway; the use of data for permitting that was not included in the FEMA published FIRM; and lack of documentation related to whether or not structures were substantially improved or substantially damaged.

FEMA provided technical assistance to the county multiple times during 2014. When documentation was not forthcoming, FEMA notified the county via letter on January 16, 2015, that the county would be placed on probation on May 18, 2015, if the documented issues were not resolved. Subsequently, FEMA notified insurance policy holders within the county of the potential probation and the potential for increased insurance surcharges should the county be put on probation. FEMA continued to provide technical assistance to the county, and, on May 13, 2015, FEMA signed a Corrective Action Plan with the county to detail the steps that the county would take to resolve the remaining identified issues, thus avoiding probation.

#### 2.1.1.4 Administer Community Rating System (CRS) and Activity Changes/Updates

The NFIP Community Rating System (CRS) was implemented in 1990 as a voluntary program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards, and was codified under the National Flood Insurance Reform Act of 1994 (42 U.S.C. § 4022(b)). Any community in full compliance with the minimum NFIP floodplain management requirements may apply to join the CRS.

Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the three goals of the CRS:

- Reduce and avoid flood damages to insurable property:
    - Protect public health and safety;
    - Reduce damage to property;
    - Prevent increases in flood damage from new construction;
    - Reduce the risk of erosion damage; and
    - Protect natural and beneficial floodplain functions.
- Strengthen and support the insurance aspects of the NFIP:
    - Improve flood insurance policy coverage; and
    - Improve actuarial rating.
- Foster comprehensive floodplain management:
    - Protect natural floodplain functions;
    - Address safety and health; and
    - Protect other community assets such as infrastructure, critical facilities and open space.

The CRS uses a class rating system to determine flood insurance premium reductions for residents. CRS classes are rated from 10 to 1. As a community engages in additional

mitigation activities, community residents become eligible for additional NFIP premium policy discounts. Each class improvement produces an additional 5 percent discount in flood insurance premiums, with a Class 1 community receiving the maximum 45 percent reduction in flood insurance premiums. The CRS recognizes 19 creditable activities, organized under 4 categories: Public Information, Mapping and Regulations, Flood Damage Reduction, and Flood Preparedness. Some CRS activities for which communities may receive credit are environmentally protective activities, such as preserving open space, creating higher standards for stormwater management, and preserving the natural and beneficial functions of floodplains.[5]

As of June 20, 2014, there are 1,296 communities receiving flood insurance premium discounts based on their implementation of local mitigation, outreach, and educational activities that go well beyond minimum NFIP requirements. Although premium discounts are one of the benefits of participation in the CRS, these communities are carrying out important activities that save lives, reduce property damage, and protect the natural and beneficial functions of floodplains. These 1,200-plus communities represent a significant portion of the nation's flood risk as evidenced by the fact that they account for over 66 percent of the NFIP's policy base.

2.1.1.5 Training/General Technical Assistance on Minimum Floodplain Management Criteria

FEMA's compliance approach focuses on encouraging and promoting compliance, rather than threatening to penalize communities for non-compliance. FEMA provides training and technical assistance to help a community achieve compliant status. FEMA gives training both to the community floodplain managers who must administer the local floodplain ordinances and to FEMA floodplain management staff. Such training is offered through FEMA's national training center, the Emergency Management Institute, local training events, conferences, workshops, webinars, home study courses, and guidance. Additionally, the Community Rating System (discussed below) provides incentives to communities undertaking such training. FEMA also encourages its floodplain management staff and community partners to become certified floodplain managers through the Certified Floodplain Management program offered by the Association of State Floodplain Managers (ASFPM). This program, which was developed with input from FEMA staff, is a formalized procedure allowing individuals to demonstrate that they have a standardized level of knowledge and skills in floodplain management and a commitment to continual education in floodplain management.

FEMA also gives technical assistance to communities. Technical assistance takes many forms, including phone and other contacts with NFIP communities, visits to communities, workshops, webinars, the issuance of procedural guidance, development of technical publications, and responding to inquiries. Technical assistance may be provided on a more formal basis through Community Assistance Contacts (CACs) and Community Assistance Visits (CAVs), as discussed below, or in response to specific inquiries by the communities. In order to reach a broader audience in a quicker amount of time, FEMA also offers workshops and webinars. Additionally, FEMA produces procedural guidance and technical publications, such as the "NFIP Guidance for Conducting CACs and CAVs" and the "NFIP Community Compliance Program Guidance."

Following major flood disasters, FEMA staff work closely with communities in providing technical assistance on the NFIP floodplain management requirements, such as the substantial damage

[5] The Coordinator's Manual for the CRS includes the CRS Schedule, which sets the criteria for CRS classification, and the CRS Commentary on the Schedule. Section 100 gives general background information on the CRS. Section 200 explains the application and verification procedures. Sections 300 through 700 explain the credit points and calculations that will be used to verify CRS credit. The procedures in these sections are used by a community to submit a modification for a better CRS classification.

requirement, and on developing a reconstruction strategy for property impacted by floods to determine appropriate mitigation measures, such as elevation, acquisition, demolition, or relocation of flood-damaged structures.

#### 2.1.1.6 Compliance Enforcement

When a potential programmatic compliance violation is reported to FEMA for further investigation, FEMA will notify the community. FEMA may also identify potential violations while conducting a CAC or a CAV. FEMA has an established process for pursuing compliance actions including technical assistance, probation, and finally suspension. Technical assistance provided to a community is often the best approach because it is a chance to provide education and find a programmatic solution that will prevent the violation from happening again. A physical violation must be mitigated to the maximum extent possible, and mitigation actions have to be approved by FEMA.

> Case Summary: Technical Assistance for Violation
>
> In May 2014, FEMA Region X became aware of a potential violation in a county in Washington on a blueberry farm. The blueberry farmers had encroached into a riparian area as they were preparing a field for planting. Region X contacted the county and made sure they were aware of the potential violation of the requirements of the Puget Sound Biological Opinion that establish a 250 ft riparian area in which there can be "no adverse effect" to species or habitat from any development. FEMA Region X and NMFS offered technical assistance to the county to help develop a mitigation plan to mitigate the adverse effects that were inadvertently caused by the development. The county has levied a $10,000 fine and is working with the property owners to develop a mitigation plan. Currently, the mitigation plan is still in development. Site restoration is required, such as measures taken to restore an altered or damaged natural feature including active steps to restore damaged wetlands, streams, protected habitat, or their buffers to the functioning condition that existed prior to an unauthorized alteration.

Most deficiencies in a community's floodplain management program or violations of local ordinances are generally due to lack of understanding of the NFIP requirements, lack of technical skills, failure to understand the rationales behind the NFIP requirements, or lack of an appreciation of the insurance implications and other consequences of a decision. Most problems that are identified can be solved through community assistance efforts.

Additionally, a community that participates in the Community Rating System (discussed below) must be fully compliant with the minimum standards of the NFIP. A CRS community that is not fully compliant will be provided an opportunity to remedy the violation to the maximum extent possible. If substantive program deficiencies or violations have not been remedied, the community will be retrograded to a lower class rating in the CRS program.

Compliance actions will be taken if any violations are identified and not remedied to the maximum extent possible (44 C.F.R. § 59.24 (b)-(c)). When a community has demonstrated a pattern of failure to enforce the NFIP floodplain management requirements and FEMA has identified substantive program deficiencies or violations, FEMA may initiate an enforcement action against the community in order to obtain compliance. A substantive violation or program deficiency is one that has resulted, or could result, in increased potential flood damages or flood stages in the community and surrounding communities. When community assistance has failed to resolve a community's compliance problems, the NFIP may place the community on probation. When a community is placed on probation, a $50 surcharge will be added to the flood insurance policies of all policyholders in that community (44 C.F.R. 59.24(b)-(c) and 61.16). Probation lasts for a minimum of one year and may be extended.

Communities that do not comply while on probation can be suspended from the NFIP. Flood insurance is not available from FEMA in communities that have been suspended (44 C.F.R. § 59.24(b)-(c)). Suspension also means that the community will be unable to obtain many forms of disaster assistance when a community suffers a disaster. Additionally, lenders will not be able to provide loans backed by the Federal government for property located in the mapped SFHA if a community is suspended from the program.

If an insured structure is identified as a violation of the community's floodplain management ordinance, FEMA can have the insurance company review the information and possibly rerate the structure to reflect the increased risk to the structure. This can result in significantly higher flood insurance rates on the structure, which may encourage the property owner to bring the building into compliance.

#### 2.1.1.7 Removal of Insurance Eligibility

In addition, pursuant to Section 1316 of the NFIA, FEMA may deny flood insurance coverage for any property in the SFHA that has been declared by a duly constituted State or local zoning authority, or other authorized public body, to be in violation of State or local floodplain management regulations (42 U.S.C. § 4023). A Section 1316 action can only be taken upon request by the State; FEMA may not initiate such an action. This removal of insurance eligibility can act as a local enforcement action within the community to encourage a non-compliant property within the community to rectify the management issue(s).

#### 2.1.1.8 Achieving Community Compliance

The NFIP compliance approach used by FEMA has three main components: (1) promotion of compliance; (2) monitoring of community programmatic compliance; and (3) enforcement. Within each of these components, FEMA has a number of tools to help the NFIP participating communities achieve compliance with the NFIP floodplain management regulations. These three components are essential to the process of achieving compliance, and FEMA often employs a number of the tools encompassed within these three components to achieve compliance (see Table 2-1).

**Table 2-1: Achieving Community Compliance with the NFIP**

| | Approaches/Components | | |
|---|---|---|---|
| | Promoting Community Compliance | Monitoring Community Compliance | Enforcing Community Compliance |
| *Tools* | Training<br><br>Technical Assistance (community assistance contacts, community assistance visits, procedural guidance, technical publications, response to inquiries, other)<br><br>Professional Certification<br><br>Incentives (insurance availability, CRS premium discounts, etc.)<br><br>Disincentives (loss of insurance availability, denial of insurance coverage (Section 1316), denial of disaster assistance, etc.) | Community Assistance Contacts (CACs) and Community Assistance Visits (CAVs), meetings<br><br>Community Rating System procedures<br><br>Community Information System (and data contained therein)<br><br>Submit-for-Rate Procedure<br><br>Complaints from citizens and others | Technical Assistance<br><br>CRS Retrograde<br><br>Require Correction of Program Deficiencies (performed by community)<br><br>Require Remediation of Violations (performed by community)<br><br>Section 1316 Declaration — for individual structure violations (declaration by community; insurance denied by FEMA)<br><br>Legal action against owner of individual structure (only by community or State)<br><br>Probation<br><br>Suspension |

In sum, FEMA's role is limited to setting the minimum criteria and then providing monitoring, oversight, and provision of technical assistance to ensure that communities are complying with the NFIP program requirements.

Case Summary: Limitations on FEMA's Legal Authority under the NFIP

These limitations on FEMA's authorities under the NFIP were recognized by the federal court in National Wildlife Federation v FEMA, 345 F.Supp.2d 1154 (W.D. Wa. 2004). In that case, Plaintiff challenged FEMA under Section 7 of the ESA, arguing that in failing to implement the Reasonable and Prudent Alternative (RPA) established by NMFS in its 2008 Biological Opinion, FEMA had failed to ensure that its implementation of the National Flood Insurance Program did not jeopardize threatened and endangered species in violation of the ESA. The court held that because FEMA is not a land use authority and it can only provide guidance, technical assistance, require reporting, and institute enforcement actions, FEMA's decision to implement the RPA to the greatest extent within its statutory authority was not arbitrary and capricious. The court further held that FEMA's implementation of the NFIP in the Puget Sound accords with the law, including the ESA.

#### 2.1.1.9 Monitor Community Compliance with NFIP via Community Assistance Visits (CAVs) / Community Assistance Contacts (CACs)

Once FEMA provides a community with the flood hazard information upon which floodplain management regulations are based, the community is required to adopt a floodplain management ordinance that meets or exceeds the minimum NFIP requirements. FEMA monitors communities to ensure that they have adopted an ordinance that meets or exceeds the minimum NFIP floodplain management criteria and to ensure that they are effectively enforcing their ordinance. A basic compliance-monitoring tool for FEMA in the NFIP is conducting CACs and CAVs. FEMA conducts Community Assistance Visits (CAVs) and Community Assistance Contacts (CACs) to monitor community floodplain management programs.

The CAC is a telephone call or brief visit to an NFIP community for the purpose of establishing or re-establishing contact to determine if any program-related problems exist and to offer assistance. A CAC includes an overview of the community's floodplain management ordinances, procedures, and enforcement provisions. A CAC can be used (1) to monitor low risk communities (i.e. communities with relatively low development pressure) to determine if technical assistance or additional follow-up is required; (2) as a screening tool for determining whether a community should receive the level of attention of a CAV; (3) as a follow-up to a CAV to ensure compliance issues have been resolved.

A CAV is a scheduled visit to an NFIP community for the purpose of conducting a comprehensive assessment of the community's floodplain management program. A CAV typically involves a tour of the floodplain, a meeting with local floodplain management officials, a review of the community's floodplain management ordinances, an examination of the community's floodplain development permit and variance files, and a meeting with the community to discuss any identified deficiencies, offer technical assistance, help address any deficiencies, and identify good floodplain management practices. Following a CAV, the community is given a reasonable amount of time to correct any program deficiencies and remedy any violations identified during the visit. As long as a community is making adequate progress toward correcting program deficiencies and remedying violations, FEMA will not initiate formal probation.

### 2.1.2 Flood Hazard Mapping

Through its Flood Hazard Mapping Program, FEMA identifies flood hazards, assesses flood risks, and collaborates with States and communities to provide accurate flood hazard and risk data to guide them to mitigation actions. The NFIA requires that FEMA identify flood-prone areas and subdivide them into flood risk zones to provide the data necessary for FEMA to determine the appropriate minimum floodplain management criteria and to rate flood insurance policies. While a variety of flood zones are mapped on FIRMs, the 100-year flood (or 1-percent-annual-chance

flood) is the standard used for implementation of the NFIP. Mapping of flood hazards promotes public awareness of the degree of hazard within such areas and provides for the expeditious identification and dissemination of flood hazard information.

#### 2.1.2.1 Decision to Publish Flood Insurance Rate Maps[6] and Development of New or Revised Flood Insurance Studies

FEMA is required by statute to revise and update flood hazard maps (a) upon a determination that such revision or updates are necessary or (b) upon request from any State or community if accompanied by technical data sufficient to justify the requested change (42 U.S.C. § 4101(f)). To assess flood hazards in a community, FEMA conducts Flood Insurance Studies (FISs) and publishes FIS reports that describe the flood hazards for the community. FEMA uses the information developed in the FIS to prepare Flood Insurance Rate Maps (FIRMs). FEMA publishes the FIRM for distribution to a wide range of users: private citizens, community officials, insurance agents and brokers, lending institutions, and other Federal agencies. The FIRM is the basis for the floodplain management, insurance, and mapping activities of the NFIP.

#### 2.1.2.2 Non-Regulatory Products and Features

FEMA provides other data layers and information to facilitate improved flood risk management and communication at the local level. Unlike regulatory flood hazard products (e.g., FIRM, FIS Report, and FIRM Database), non-regulatory products are not intended to be used as the basis for official actions required under the NFIP, such as determining the insurance rate for a property or enforcing minimum building standards for construction in a floodplain. These products work alongside regulatory products to provide additional flood risk information and to support a community's overall floodplain management and hazard mitigation strategies and plans. There are also two key non-regulatory features, the Limit of Moderate Wave Action (LiMWA) and future conditions layers on existing FIRMs. Although these do not exist as separate products because they are placed on the actual FIRM, these are considered non-regulatory features because they are not associated with any regulatory requirements under the NFIP (although communities may, and do, choose to regulate based on these non-regulatory features).

*LiMWA*. Dangerous flood hazards can also exist in coastal areas affected by waves equal to or greater than 1.5 feet in height during the 1-percent-annual-chance flood. FEMA now delineates the LiMWA, which depicts the portion of the SFHA where base flood wave heights are between 1.5 feet and 3 feet, on all new coastal Risk MAP studies to assist communities interested in voluntarily applying V-zone requirements in those areas.

*Future Conditions Maps.* At the request of the community, FEMA may indicate zones to identify areas of future-conditions flood hazards. See 44 C.F.R. § 64.3. The future conditions flood hazard information is provided for informational purposes only, and it is up to the community to decide whether to use the information to regulate floodplain development.

#### 2.1.2.3 Map Sequencing

The FEMA Flood Hazard Mapping Program (Risk MAP) is allocated a budget each year by Congress. With that budget, FEMA must meet regulatory requirements; respond to stakeholder correspondence; distribute flood hazard data products; establish and maintain cost and schedule controls; track and monitor performance; support the development of State and local capabilities through the Cooperating Technical Partners program and carry out other core program functions. These core functions utilize a significant portion of the budget.

The remaining funds are allocated to the overall program priorities established by the administration in the President's budget. Since 2009, one of the major budgetary commitments

[6] This covers the first two Flood Hazard Mapping components in Table 2-1.

has been to update the maps for 100% of the populated coastline. In recent years, FEMA also has significant commitments to update analyses and maps affected by flood protection systems. The remaining budget is allocated to addressing other needs. Congress often establishes mapping priorities from year to year in appropriations legislation. FEMA must incorporate those priorities in determining how to allocate funding to specific mapping activities.

Risk MAP is addressing mapping needs by watershed. The overall guiding principle for Risk MAP project selection is that watersheds are prioritized for update based on both the level of flood risk and the need for flood hazard data updates. Risk MAP has developed an estimate of flood risk across the country and has tools that allow staff to rank watersheds based on this flood risk estimate. Risk MAP also has a system called the Coordinated Needs Management System (CNMS) for tracking flooding sources for which an updated flood hazard map is needed.

#### 2.1.2.4 Letters of Map Change

FEMA can also revise or amend maps through a Letter of Map Change (LOMC). There are a number of LOMCs that FEMA issues including the Letter of Map Amendment (LOMA), the Letter of Map Revision (LOMR), and the Letter of Map Revision based on Fill (LOMR-F). A LOMR is FEMA's modification to an effective FIRM based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of an existing regulatory floodway,[7] the effective BFEs, or the SFHA. A LOMR-F is a revision to the effective FIRM that establishes whether a specific property is located in an SFHA based on the placement of fill. In addition, there are limitations imposed by the scale at which the maps are prepared, which may result in individual properties being inadvertently included in SFHAs. FEMA has developed a process, referred to as a LOMA, to correct these inadvertent inclusions. A LOMA is issued pursuant to an administrative procedure that involves the review of technical data submitted by the owner of property who believes the property has incorrectly been included in a designated SFHA. A LOMA establishes whether a specific property, or a specific structure on the property, is or is not located in an SFHA.

NFIP regulations require FEMA to revise and amend maps and FIS reports, as warranted or in response to requests from community officials and individual property owners. In making revisions and amendments, FEMA must adhere to the same engineering standards applied in the preparation of the original FIRMs and FIS reports. Therefore, when requesting changes to FIRMs and FIS reports, community officials and property owners are required to submit adequate supporting data. Those data enable FEMA to review and evaluate the requests and to carry out its responsibility of ensuring that the flood-risk information presented is scientifically and technically correct.

To help FEMA ensure that the maps and reports present information that accurately reflects existing flood risks, the NFIP regulations require that each NFIP community inform FEMA of any physical changes that affect BFEs in the community and, within six months of the date that such data are available, submit data that show the effects of the changes.

#### 2.1.2.5 Letter of Determination Review

A Letter of Determination Review (LODR) is an option available to a property owner to appeal a lender's flood zone determination. The request can be made to FEMA, at a current cost of $80, jointly by a lender and borrower within 45 days of the notice to the borrower that the building is located within the SFHA by the lender. The LODR review process enables FEMA to verify whether the building's location was correctly identified on the applicable FIRM. A successful LODR releases the lender from the statutory obligation to require the purchase of flood insurance

[7] The regulatory floodway is the channel that must be kept clear of obstructions to allow passage of the 1-percent-annual-chance flood without causing the water surface elevation to rise beyond a designated height in the SFHA.

and identifies the building in a low to moderate flood risk area. However, lenders retain the prerogative to require flood insurance absent the Federal requirement, but as a regulatory safety and soundness measure. This process does not consider the elevation of the structure above the flood level. It considers only the location of the structure relative to the SFHA shown on the effective FIRM.

#### 2.1.2.6 Conditional Letters of Map Change

Because LOMAs, LOMR-Fs, and LOMRs officially amend or revise the flood maps, they must reflect existing conditions, such as an "as-built" project. However, communities, developers, and property owners may submit requests for proposed projects in floodplain areas to FEMA for review and comment. A Conditional Letter of Map Amendment (CLOMA), Conditional Letter of Map Revision Based on Fill (CLOMR-F), or Conditional Letter of Map Revision (CLOMR) are FEMA's comment on whether the proposed project, if built as proposed, would warrant a map revision. A CLOMA, CLOMR-F, or CLOMR does not constitute a building permit or approval; the authority to approve projects and issue building permits lies with the local community and, in some instances, State agencies.

Because CLOMR and CLOMR-F requests are submitted to FEMA prior to construction, there is an opportunity for the project proponent to identify whether threatened and endangered species may be affected by the potential project. If potential adverse impacts could occur, then the U.S. Fish & Wildlife Service or the National Marine Fisheries Service (collectively "the Services") may require the project proponent to make changes to the proposed activity and/or incorporate mitigation measures.

On October 19, 2015, FEMA released a memorandum providing clarifying guidance on the reviewing and processing of Conditional Letters of Map Revision (CLOMRs) and Conditional Letters of Map Revision based-on Fill (CLOMR-Fs). Specifically, this memorandum clarified a requestor's responsibilities for documenting Endangered Species Act (ESA) compliance when requesting CLOMRs and CLOMR-Fs.

FEMA requires ESA compliance to be documented for all CLOMR and CLOMR-F applications prior to issuing a comment. The CLOMR/CLOMR-F request will not be processed by FEMA until FEMA receives this documentation. Unless FEMA is directly involved with the project's construction or funding, documentation of ESA compliance should be obtained without FEMA's involvement.

For projects with Federal construction, funding, or permitting, documentation of a "No Effect" determination from the Federal action agency, a "not likely to adversely affect" determination by the Federal action agency with concurrence from the Services, or other approval from the Services is required before FEMA will issue a CLOMR or CLOMR-F.

For non-Federal actions, the CLOMR/CLOMR-F request will be processed by FEMA only after FEMA receives documentation of compliance with the ESA from the requestor. For these projects, the requestor must document that a "take"—meaning to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct -will not occur to threatened and endangered species as a result of the project. If a project has the potential to "take" listed species, an Incidental Take Permit may be submitted with documentation showing that the proposed project is the subject, or is covered by the subject, of the permit.

#### 2.1.2.7 Data Development and Dissemination

Under the NFIA, as amended, FEMA is required by Congress to identify flood-prone areas and to subdivide them into flood risk zones to promote public awareness of the degree of hazard within such areas and to provide for the expeditious identification and dissemination of flood hazard

information (42 U.S.C. § 4101). Typically, data dissemination includes publication of flood hazard data on FEMA's website and distribution of flood hazard data to communities when new data becomes available.

#### 2.1.2.8 Community Outreach, Training, and General Technical Assistance

FEMA encourages and promotes the NFIP by providing outreach, training, and technical assistance. FEMA provides training through webinars and in person trainings to a wide stakeholder audience. Technical assistance can include phone and other contacts with stakeholders, workshops, webinars, the issuance of procedural guidance, development of technical publications, and responding to inquiries.

#### 2.1.2.9 Implementing Mapping Standards, Policies, and Regulations

To assure accuracy and consistency nationwide, FEMA has established standards for flood map studies, as well as the associated coordination and documentation activities. FEMA has also established product specifications for FIS reports, maps, and related NFIP products. These standards are provided in FEMA Policy FP 204-078-1: Standards for Flood Risk Analysis and Mapping. The product specifications are published as separate technical reference documents. These documents are available at http://www.fema.gov/guidelines-and-standards-flood-risk-analysis-and-mapping. In addition, FEMA provides supplemental guidance to support implementation of the standards. This guidance is a recommended method to meet the standard. However, acceptable approaches are not limited to this recommended method; mapping partners may use other methods to meet or exceed the standard. FEMA also has a number of regulations establishing its process for identification of flood hazards. See 44 C.F.R. Parts 64, 65, 67, 70, and 72.

#### 2.1.2.10 Levees Accreditation Process

FEMA does not certify, design, construct, permit, or otherwise approve levees, levee systems, or floodwalls. However, FEMA has criteria that must be met before any levee, levee system, or floodwall can be depicted on a FIRM as providing risk reduction from the 1-percent-annual-chance flood, also referred to as the base flood. These criteria may be found in 44 C.F.R. § 65.10. To be depicted on a FIRM as providing risk reduction from the base flood, or accredited, the community or other party must provide FEMA with specific data certified by a registered engineer or a Federal agency with responsibility for levee design demonstrating the levee, levee system, or floodwall provides protection from the base flood. FEMA's review of this data is "for the sole purpose of establish[ing] appropriate risk-zone determinations for NFIP maps" and does not "constitute a determination or warranty by FEMA as to how a structure or system will perform in a flood event." FEMA only recognizes a levee, levee system, or floodwall that meets, and continues to meet, the minimum design, operation, and maintenance criteria established in 44 C.F.R. § 65.10. These requirements must be satisfied before such a structure may be accredited and then mapped as providing risk reduction from the 1-percent-annual-chance flood event, typically through the LOMR process (44 C.F.R. § 65.10; 44 C.F.R. § 65.2).

#### 2.1.2.11 AR Zone Determinations

Participating communities, as well as Federal and State agencies, may restore the flood protection and risk reduction capability of existing levee systems to reduce flood risks in a particular community or particular area of a State. When such projects involve restoration of a levee system that meets the criteria in 44 C.F.R. § 65.14, a community may choose to submit the appropriate data and documentation to FEMA and request that FEMA make a "flood protection restoration" determination.

Zone AR is a flood insurance risk zone designation that may be used by FEMA to identify flood risk on a FIRM in areas where a flood protection system (i.e., levee system) previously credited

with providing protection against the 1-percent-annual-chance or greater level of flood protection no longer provides that level of protection (42 U.S.C. § 4014(f)).

A community may be eligible for the Zone AR designation if the community is engaged in the process of restoring a flood protection system that was:

- Recognized as providing 1-percent-annual-chance flood protection on the effective FIRM; and
- Decertified by a Federal agency responsible for flood protection design or construction (44 C.F.R. § 65.14).

If the community meets these requirements and FEMA makes a "flood protection restoration" determination, FEMA is statutorily required to change the zone designation of the levee-impacted areas by updating the FIRM panels, typically by issuing a LOMR, to Zone AR and apply the flood insurance premium rates applicable to Zone AR. However, the mandatory flood insurance purchase requirement is still in effect for areas receiving the zone designation change, and the floodplain management criteria still apply to these areas. (44 C.F.R. § 60.3(f))

2.1.2.12 Zone A99 Determinations

Federal and State agencies, and communities, may design and build new levee systems, or they may restore the flood risk-reduction capability of existing levee systems, to reduce flood risks in a particular community or particular area of a State. When certain milestones are met, a community may choose to submit the appropriate data and documentation to FEMA and request an "adequate progress" determination. To establish eligibility for an "adequate progress determination," the community must show that:

- 100 percent of the total financial project cost of the completed flood protection system has been authorized;
- At least 50 percent of the total financial project cost of the completed flood protection system has been expended;
- At least 60 percent of the total financial project cost of the completed flood protection system has been appropriated;
- All critical features of the flood protection system, as identified by FEMA, are under construction, and each critical feature is 50 percent completed as measured by the actual expenditure of the estimated construction budget funds; and
- The community has not been responsible for any delay in the completion of the system (42 U.S.C. § 4014(e); 44 C.F.R. § 61.12).

If the community meets the above criteria and FEMA makes an adequate progress determination, FEMA is statutorily required to change the zone designation to Zone A99 for the levee-impacted area by updating the FIRM panels, typically by issuing a LOMR, and apply the flood insurance premium rates that would be applicable when the project is completed (42 U.S.C. §4014(e)). However, the mandatory flood insurance purchase requirement is still in effect for areas receiving the designation change, and the floodplain management criteria still apply to these areas (44 C.F.R. § 60.3(f)).

### 2.1.3 Flood Insurance

Since its enactment in 1968, the NFIA has made flood insurance available to property owners or lessees in communities that participate in the NFIP. Through the NFIP, property owners in participating communities are able to insure their property against future flood losses. The risk

zones shown on the FIRMs are the basis for the establishment of premium rates for flood coverage offered through the NFIP.

Congress recognized that insurance for "existing buildings" constructed before a community joined the NFIP could be expensive if the premiums were not subsidized by the Federal government. Congress also recognized that most of these older flood-prone buildings were built by individuals who did not have sufficient knowledge of the flood hazard to make informed decisions. Under the NFIP, "existing buildings" are generally referred to as Pre-FIRM flood insurance buildings. These buildings were built before the flood risk was known and identified on the community's FIRM.

As originally established, the NFIA authorized FEMA to provide subsidized flood insurance only for existing buildings or buildings built prior to the community's first FIRM (generally referred to as "pre-FIRM buildings." This means that flood insurance for new development has never been subsidized by the NFIP (subject to the very limited, short-term exceptions established in 42 U.S.C. § 4014(e)-(f)).

However, subject to the very limited, short term statutory exceptions referenced above, FEMA must apply actuarial rates to all buildings constructed, or substantially damaged or improved, on or after the effective date of the initial FIRM for the community or after December 31, 1974, whichever is later (generally referred to as post-FIRM buildings) (42 U.S.C. §§ 4014(a)(1), 4015(b)).

As discussed in the Program Changes section below, with the passage of the Biggert Waters Reform Act of 2012 (Biggert Waters) and the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA), FEMA is required to phase out the subsidies on pre-FIRM properties. Some subsidies must be phased out immediately, some will be phased out at a rate of 25 percent premium rate increases per year, and the rest will be phased out at a rate of 5-15 percent premium rate increases per year. Accordingly, when this phase out is completed, FEMA will not offer subsidized flood insurance for either new or existing floodplain development (subject to certain limited, short term statutory exceptions). As such, the premium rates on NFIP policies will be comparable to the premium rates offered on the private flood insurance market.

The following are aspects of administering the provision of flood insurance.

#### 2.1.3.1 Administer Write-Your-Own (WYO) Program

FEMA's Write-Your-Own (WYO) Program allows participating property and casualty insurance companies to write and service NFIP flood insurance policies in their own names. The WYO Program began in 1983 and is a cooperative undertaking of the insurance industry and FEMA. The WYO insurers retain an expense allowance (which includes agents' commissions) and remit the remaining premium to the Federal government. The WYO insurers pay flood losses and loss adjustment expenses based on a fee schedule. Both are paid through the regulated access of Federal funds; the WYO companies do not pay flood losses or loss adjustment expenses out of their own funds. In addition, under certain circumstances, reimbursement for litigation costs, including court costs, attorney fees, judgments, and settlements, are paid by FEMA based on documentation submitted by the WYO insurers.

#### 2.1.3.2 Develop & Publish Flood Insurance Rate Tables

The development of insurance rate tables is based on insurance risk calculations and the predicted damage to a specific building type in a specific hazard area. The type and elevation of a building, along with the hazard zone that the building is located in, will determine the flood insurance premium rate. The publication of insurance premium rate tables is an administrative action that involves publishing updated premium rate tables.

#### 2.1.3.3 Insurance Policy Management

FEMA, or the WYO companies on FEMA's behalf, issue, sell, renew, process refunds, and process appeals for NFIP flood insurance policies. Policies are rated based on the published insurance premium rate tables for specific building types and flood hazard areas. Flood insurance is available to all property owners and lessees in communities that participate in the NFIP. Flood insurance is typically provided once construction has been completed on an insurable structure.

#### 2.1.3.4 Educate Insurance Agents/Educate and Certify Claims Adjusters

Property owners and lessees in NFIP participating communities typically acquire flood insurance through local insurance agents, who service the flood insurance policy. If there is a loss on the policy, a claims adjuster, typically an independent contractor will adjust the claim. FEMA provides education to insurance agents and claims adjusters on topics related to selling, issuing, renewing, processing premium refunds for, and adjusting the claims of NFIP flood insurance policies, as well as other flood insurance-related topics.

#### 2.1.3.5 Adjust Loss / Pay Valid Claims

When a loss is reported, FEMA and the WYO companies, based on the recommendations of the claims adjusters, must determine the amount of damage to the buildings and/or contents, whether or not the damage was caused by flooding, and the appropriate payout under the insurance policy.

#### 2.1.3.6 Provide General Technical Assistance

FEMA provides general technical assistance on insurance related topics as needed to agents, WYO companies, adjusters, policyholders and other stakeholders. This technical assistance can include bulletins, guidance, webinars and responding to inquiries.

#### 2.1.3.7 Marketing

FEMA has a public marketing campaign through FloodSmart to educate the public on the risk of flooding and the availability of flood insurance through the NFIP. Information about the campaign can be found at www.floodsmart.gov.

## 2.2 Proposed Action (Part 2): Program Changes to the National Flood Insurance Program

The second component of the Proposed Action is the proposed program changes to the current implementation of the NFIP. Some of these proposed changes are the result of recent legislation amending the National Flood Insurance Act. FEMA developed other program changes to comply with the requirements of Section 7 of the ESA.

Notably, although all the changes related to the recent legislation are discussed together for the sake of consistency, some of these changes have already been implemented and, as such, would be considered part of the current program for the purposes of this evaluation, and not proposed changes to the current program. Such changes are indicated with an explanatory footnote.

### 2.2.1 Program Changes Resulting from Recent Legislation

On July 6, 2012, Congress passed the Biggert-Waters Flood Insurance Reform Act of 2012 (Biggert Waters) (P. Law 112-141). This Act requires FEMA to make a number of changes to the administration of the NFIP. Key provisions of the legislation include the requirement to phase out subsidies for certain pre-FIRM properties, the establishment of a Reserve Fund, and the creation of the Technical Mapping Advisory Council (TMAC) to develop recommendations for FEMA's flood hazard mapping program.

Some of the required changes will result in premium rate increases for all policyholders. To assess the impacts of these rate increases, Biggert Waters also requires FEMA and the National Academy of Sciences to complete an affordability study (as stipulated within Biggert Waters).

Additionally, Biggert Waters requires FEMA to establish an option for non-escrowed policyholders (i.e., for the most part, policyholders not subject to the mandatory purchase requirements) to pay flood insurance premiums through a monthly installment plan. This may help alleviate the affordability concerns of policyholders who voluntarily choose to purchase flood insurance.

Key provisions of the Biggert Waters legislation include the requirement to phase out subsidies for certain pre-FIRM properties. The pre-FIRM properties for which subsidies will be phased out include non-primary residences, business properties, severe repetitive loss properties, substantially damaged properties, substantially improved properties, and properties for which the cumulative claims payments exceed the fair market value of the property. As of 2013, FEMA began phasing in full risk rates for pre-FIRM non-primary residences, severe repetitive loss properties (1-4 residences), and properties where the cumulative claims payments exceed the fair market value of the property. Biggert Waters mandates that the premium rates on these properties be increased by 25 percent each year until full risk rates are achieved. Biggert Waters also mandates the immediate removal of subsidies for pre-FIRM properties when a lapsed policy is renewed, but only if that policy lapsed as a result of the deliberate choice of the policyholder.

Biggert Waters also established a Reserve Fund, which is an account that would be established separate from other program funds and would be "available for meeting the expected future obligations of the flood insurance program…" FEMA funds this account through a Reserve Fund Assessment added to the premium on NFIP policies. The Reserve Fund Assessment is primarily designed to build reserves to help meet expected future obligations in higher than average loss years. However, the funds can also be used to pay interest or principal on the current large amount of Program borrowing. Introduced in October 2013 as a 5 percent assessment, the Reserve Fund Assessment is currently a 15 percent assessment on most policies (10 percent assessment on Preferred Risk Policies). That percentage is expected to increase until the annual collections from the Reserve Fund Assessment reaches the statutory minimum amount, which at the time it was introduced was about $1 billion annually.[8]

On March 21, 2014, President Obama signed into law the Homeowner Flood Insurance Affordability Act of 2014 (HFIAA) (P. Law 113-89). HFIAA removed some of the provisions, not included in the above discussion on Biggert-Waters, requiring the phase out of subsidies on pre-FIRM properties. Additionally, HFIAA amended the Biggert Waters provision requiring application of full risk rates to policies renewed after a lapse to exclude policies that lapsed because the policyholder was no longer required to maintain flood insurance. However, HFIAA also required a phase out of subsidies on all pre-FIRM properties (not otherwise addressed by the Biggert Waters premium rate increase provisions) at a rate of no less than 5 percent, and no more than 15 percent, premium rate increases per year, with no individual policy exceeding an 18 percent premium rate increase. Accordingly, the subsidies on pre-FIRM properties will likely be phased out within the next 10 to 20 years.

Under HFIAA, other changes to the NFIP include a new surcharge for all new and renewed policies to offset the subsidized policies and achieve the financial sustainability goals of Biggert Waters (a $25 surcharge on all primary residence policies and a $250 surcharge on all other policies). Implementation of the new surcharge begins in 2015 on all policies. To provide policyholders with an option for reducing policy premiums, HFIAA raises the maximum 1-4 family residential deductible limits from $5,000 to $10,000. In addition, HFIAA requires FEMA to utilize the results of the Biggert Waters affordability study (the scope of which was expanded by HFIAA)

[8] Because this provision has already been fully implemented, FEMA considers this as part of the current program for the purposes of this evaluation, not as a proposed change.

to establish an affordability framework to address the affordability issues that have arisen since the passage of Biggert Waters and the associated premium rate increases.[9]

Additionally, HFIAA requires FEMA to set the premium rates for certain properties newly mapped into the SFHA at the same rate as Preferred Risk Policies, after which full risk rates will be phased in. This was also intended as a measure to alleviate affordability concerns by allowing for the phase-in of full risk rates for these policyholders.[10]

### 2.2.2 Program Changes to Comply with the Endangered Species Act

As explained in detail throughout this evaluation, private floodplain development is not an action under the NFIP. FEMA does not fund, authorize, or carry out private floodplain development through the NFIP. Similarly, the NFIP does not cause private floodplain development to occur, nor does it control the rate or quantity of development or the effects of those development activities may have on ESA-listed species or designated critical habitat. As discussed in Section 3.6, available research and studies suggest that the NFIP is not a significant factor in the determination of whether or not to develop in the floodplain. Nevertheless, some perceive that certain actions taken under the NFIP –specifically the issuance of certain Letters of Map Change (LOMC), mapping a levee system as meeting the requirements for accreditation, or designating a levee system in an AR or A99 Zone –encourage some development in the floodplain.

#### 2.2.2.1 LOMCs

The specific LOMCs of interest are Letters of Map Revision (LOMRs) and Letters of Map Revision Based on Fill (LOMR-Fs). A Letter of Map Revision (LOMR) is FEMA's modification to an effective Flood Insurance Rate Map (FIRM). LOMRs are generally issued to update hydrologic or hydraulic characteristics of a flooding source that result in the modification of the existing regulatory floodway, the effective Base Flood Elevations (BFEs), or the Special Flood Hazard Area (SFHA). While many of these revisions are based on the completion of a physical project that would impact the hydrologic or hydraulic characteristics of a flooding source, not all LOMRs are based on physical projects. Updated technical data, such as topography or alternative models and analyses, may impact the Floodway, SFHA, or BFEs without the completion of a physical project.

A LOMR-F is when a property is located or will be located in an SFHA, property owners or project proponents choose to elevate the grade of the land on their properties through the placement of fill in order to elevate the grade of the land above the projected 1-percent-annual-chance flood elevation (also known as the BFE). This would elevate the land outside the SFHA and, thus, out of the area of flood hazard. This is an effective method of reducing the risk of flood damage to property and protecting against loss of life in the event of a flood. In fact, it is so effective that some States choose to prescribe this as the only method of elevating structures. Once a property is elevated above the SFHA, it is eligible to be identified as outside of the SFHA through the issuance of a LOMR-F.

Once a property is shown or determined to be out of the SFHA, whether through the issuance of a LOMR or LOMR-F, there are other perceived benefits to the property owner beyond flood risk reduction. The first benefit is that the property owner is no longer subject to the mandatory purchase requirement of 42 USC 4012a, which applies only to structures located in the SFHA. The second benefit is that the property is no longer subject to the minimum floodplain

[9] Because this provision has already been fully implemented, FEMA considers this as part of the current program for the purposes of this evaluation, not as a proposed change.

[10] Because this provision has already been fully implemented, FEMA considers this as part of the current program for the purposes of this evaluation, not as a proposed change.

management regulations, which apply only to properties located in the SFHA. However, it is important to note that communities can, and do, regulate floodplain management outside the context of the NFIP, and they also frequently place floodplain management requirements on individuals within the community that go beyond the minimum floodplain management requirements of the NFIP.

Because these benefits extend beyond flood risk reduction, some perceive that the NFIP encourages the placement of fill for the purpose of having the property removed from the SFHA and the requirements attendant to properties in the SFHA. Such floodplain development might trigger ESA compliance requirements if it caused adverse impacts to ESA-listed species and designated critical habitat in violation of the ESA. Notably, there are no studies that support the causal relationship between FEMA's issuance of LOMR-Fs and increased incidence of the placement of fill–other than one study based on the perceptions of a very small study sample of certain NFIP stakeholders. (American Institutes for Research - Rosenbaum, W. and Boulware, G., 2006)

#### 2.2.2.2 Mapping a Levee System as Accredited

As discussed above, FEMA does not certify, design, construct, permit, or otherwise approve levees, levee systems, or floodwalls. However, FEMA has regulatory requirements (44 C.F.R. § 65.10) that must be met before any levee, levee system, or floodwall can be depicted on a FIRM as reducing the risk of the 1-percent-annual-chance flood, also referred to as the base flood. While there are no immediate consequences to the determination that a levee system meets levee accreditation requirements described in 44 C.F.R. § 65.10, generally the issuance of a LOMR will revise the flood hazards shown on the effective FIRM, as appropriate, to identify the area landward of the levee as outside the SFHA. In addition to the reduction of flood risk to these properties provided by the levee system, the property owners would incur the same perceived benefits associated with removal of the SFHA designation described above (e.g., removal from mandatory purchase requirement and applicability of FEMA's minimum floodplain management requirements).

#### 2.2.2.3 AR/A99 Zone Determinations

As discussed above, participating communities, as well as Federal and State agencies, may restore the risk reduction capability of existing levee systems to reduce flood risks in a particular community or particular area of a State. Zone AR is a flood insurance risk zone designation given to previously accredited levee systems that have been decertified, but are determined to be in the process of being restored to provide risk reduction to the 1-percent-annual-chance or greater flood (42 U.S.C. § 4014(f)). If the community meets the requirements of 44 C.F.R. § 65.14 and FEMA makes a "flood protection restoration" determination, FEMA is statutorily required to change the zone designation of the levee-impacted areas to Zone AR by updating the FIRM panels, typically by issuing a LOMR, and apply the flood insurance premium rates applicable to Zone AR.

Likewise, Federal and State agencies, and communities, may design and build new levee systems, or they may restore the flood risk-reduction capability of existing levee systems, to reduce flood risks in a particular community or particular area of a State. Zone A99 is a flood insurance risk zone designation that may be used by FEMA in areas subject to inundation by the 1-percent-annual-chance flood event, but which will ultimately have this risk reduced upon completion of an under-construction levee system. If the community meets the criteria established in 44 C.F.R. § 60.3(f) and FEMA makes an adequate progress determination, FEMA is statutorily required to change the zone designation to Zone A99 for the levee-impacted area by updating the FIRM panels, typically by issuing a LOMR, and apply the flood insurance premium rates that would be applicable when the project is completed (42 U.S.C. §4014(e)).

However, although an AR or A99 zone determination could result in lower flood insurance rates, the mandatory flood insurance purchase requirement is still in effect for areas receiving these zone designation changes, and the floodplain management criteria still apply to these areas.

#### 2.2.2.4 Description of Proposed Changes

The issuance of LOMRs and LOMR-Fs is a non-discretionary action for which FEMA has no obligation to consult. Nevertheless, to the extent that the issuance of certain letters of map change are perceived to offer some encouragement to develop in the floodplain, FEMA proposes to take measures within its discretion to demonstrate that its actions in issuing LOMRs and LOMR-Fs are ESA-compliant. FEMA is not responsible for private floodplain development, or for ensuring that such development is compliant with the ESA. FEMA does require written assurance of compliance with appropriate sections of 44 C.F.R. § 60.3 be provided by the participating community prior to processing a LOMR or a LOMR-F request.

Currently, FEMA's minimum floodplain management criteria at 44 C.F.R. § 60.3(a)(2) requires communities to, for all floodplain development permits, "review [the] proposed development to ensure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law…" FEMA proposes to issue clarification guidance stating that, under this minimum floodplain management criterion, the community must obtain and maintain documentation of compliance with the ESA for the proposed floodplain development. Furthermore, FEMA will require the community, or the project proponent on the community's behalf, to produce documentation of compliance with the ESA prior to processing LOMR and LOMR-F requests based on physical development in the floodplain. By documenting that the private floodplain development for which a LOMR or LOMR-F is sought is ESA-compliant, FEMA can demonstrate that it is only issuing LOMRs or LOMR-Fs for ESA-compliant floodplain development (and, thus, not encouraging floodplain development that adversely impacts ESA-listed species and designated critical habitat). As discussed above, FEMA has always required compliance with the ESA as a condition of the community's issuance of a floodplain development permit. This proposed clarification would simply add a documentation requirement that would assist FEMA and the NFIP-participating communities in documenting this compliance. Notably, the LOMC documentation requirement would also cover LOMCs associated with the mapping of levee accreditations, as well as AR zone and A99 zone determinations.

### 2.2.3 Summary of Proposed Program Changes

Modifications to the NFIP include:

1) Changes to Floodplain Management:
   a) Clarify that pursuant to 44 C.F.R. § 60.3(a)(2), a community must obtain and maintain documentation of compliance with the appropriate Federal and state laws, including the ESA, as a condition of issuing floodplain development permits.

2) Changes to Flood Hazard Mapping:
   a) Clarify that certain letter of map change requests will not be processed until the community or project proponent has submitted documentation of compliance with the ESA.

3) Changes to Flood Insurance:
   a) Phase out of subsidies on certain pre-FIRM properties (non-primary residences, business properties, severe repetitive loss properties, substantially damaged or improved properties, and properties for which the cumulative claims payments exceed the fair market value of the property) at a rate of 25 percent premium rate increases per year.*[11]

[11] An asterisk (*) indicates that the proposed action is legislatively required.

b) Phase out of subsidies on all other pre-FIRM properties through annual premium rate increases of an average rate of at least 5 percent, but no more than 15 percent, per risk classification, with no individual policy exceeding an 18 percent premium rate increase.*

c) Development of a monthly installment plan payment option for non-escrowed flood insurance premiums.*

### 2.2.4 Discretion

The actions and program elements comprising the NFIP are a mix of direct mandates (providing little or no flexibility in implementation) and discretionary actions. Federal agencies are only required to consult under Section 7(a)(2) if there is discretionary involvement or control. "[W]here the Federal agency lacks the discretion to influence the private action, consultation would be a meaningless exercise; the agency simply does not possess the ability to implement measures that inure to the benefit [of] the protected species" (50 C.F.R. § 402.03). Accordingly, per the requirements of the Services' ESA-implementing regulations, Section 7 consultations typically focus on the actions where a Federal agency has discretionary control over implementation of the action. In *National Wildlife Federation v. FEMA*, the court held that the provision of flood insurance is a non-discretionary action for which "FEMA has no obligation to consult" (National Wildlife Federation v. Federal Emergency Management Agency, 2004) (emphasis added).

However, in technical assistance meetings held prior to the initiation of this evaluation, the Services have advised FEMA that in practice, it looks at the effects of both discretionary and non-discretionary actions when assessing the effects of a program on ESA-listed species and designated critical habitat. The Services further advised FEMA that they would consider any BE that only analyzed discretionary NFIP actions to be deficient. As such, FEMA has consented to assess the effects of all aspects of the program. However, in order to ensure that any recommended program changes are limited to areas in which FEMA has discretion to make changes for the purposes of ESA compliance, FEMA has identified which actions are discretionary and which actions are non-discretionary. Table 2-2 indicates where FEMA has discretion (where FEMA has the authority to make a decision) or no discretion (actions that are mandated by statute). The NFIP Program Description, which is included at Appendix B, provides a more detailed description of the Program and the elements and components of the NFIP.

Nevertheless, even where a component action has been identified as discretionary, this is not an indication that the action is completely discretionary. For example, the establishment of the floodplain management criteria is identified as discretionary, but the general authority to develop these criteria is not unfettered. Rather, it is limited by the language of the statute in several significant ways. Among other limitations, the minimum floodplain management criteria must be (a) necessary to achieve the purposes laid out in 42 U.S.C. § 4102, (b) feasible, and (c) practicable. They must also be developed based on studies and investigations carried out by FEMA (42 U.S.C. § 4102; 42 U.S.C. § 4001(e)(2)). Similarly, Congress's direction to FEMA to map flood hazards is also not unrestricted. Because FEMA flood maps may be challenged on the basis of scientific or technical correctness, FEMA must use the best available science and data in support of its maps regardless of the impacts of doing so (e.g., a reduction in the size of the SFHA). While this distinction does not affect FEMA's analysis of the effects of the Proposed Action in this document, it did inform FEMA's decision-making process in identifying the proposed program changes discussed in this section.

### 2.2.5 Summary of Proposed Action

The Proposed Action evaluated in this BE is the implementation of the NFIP in the United States as modified by recent legislation and proposed program changes to comply with ESA

requirements. The three elements of the Proposed Action on which FEMA is conducting an assessment of effects are Floodplain Management, Flood Hazard Mapping, and Flood Insurance. Table 2-2 identifies the NFIP elements and the individual components under each element for which FEMA will be making effects determinations. Table 2-2 also indicates the proposed changes to the component actions of the NFIP that are included as part of the Proposed Action. FEMA is only assessing the effects of the FEMA actions identified in this table.

**Table 2-2: Proposed Action**

| NFIP Element | Proposed Action | | Discretion/ No Discretion | Effects Determination |
|---|---|---|---|---|
| | Existing Component | Modification | | |
| Floodplain Management | Implementing Minimum Floodplain Management Criteria | Clarify that pursuant to 44 C.F.R. § 60.3(a)(2), a community must obtain and maintain documentation of compliance with the appropriate Federal and state laws, including the ESA, as a condition of issuing floodplain development permits. | Discretion | NE |
| | Enroll Communities in the NFIP | No change | No discretion | NE |
| | Monitor Communities' Compliance with NFIP via Community Assistance Visits (CAVs)/Community Assistance Contacts (CACs) | No change | Discretion | NE |
| | Compliance Enforcement (e.g., probation, suspension, CRS retrogrades) | No change | Discretion | NE |
| | Administer the Map Adoption Process | No change | No discretion | NE |
| | Administer Community Rating System (CRS) (includes awarding points for CRS Class ratings) | No change | Discretion | NE |
| | CRS Activity Changes / Updates | No change | Discretion | NE |
| | Training / General Technical Assistance on Minimum Floodplain Management Criteria | No change | Discretion | NE |
| | Removal of Insurance Eligibility (pursuant to Section 1316) | No change | No discretion | NE |
| Flood Hazard Mapping | Decision to Publish Flood Insurance Rate Maps (FIRMs)—decision on level of study performed | No change | Discretion | NE |
| | Development of New or Revised Flood Insurance Studies (FIS) and SFHA Maps | No change | No discretion | NE |

| | | | | |
|---|---|---|---|---|
| | – making an FIS, engineering analysis | | | |
| | Non-regulatory Products and Features | No change | Discretion | NE |
| | Map Sequencing | No change | Discretion | NE |
| | Letter of Map Amendment (LOMA) and Letter of Determination Review (LODR) | No change | No discretion | NE |
| | Letter of Map Revision (LOMR) and Letter of Map Revision Based on Fill (LOMR-F) | Clarify that certain letter of map change requests will not be issued until the community or project proponent has submitted documentation of compliance with the ESA. | No discretion | NE |
| | Conditional Letter of Map Revision (CLOMR) | No change | Discretion | NE |
| | Conditional Letter of Map Revision Based on Fill (CLOMR-F) | No change | Discretion | NE |
| | Conditional Letter of Map Amendment (CLOMA) | No change | Discretion | NE |
| | Data Development and Dissemination | No change | Discretion | NE |
| | Community Outreach, Training, and General Technical Assistance | No change | Discretion | NE |
| | Implementing Mapping Standards, Policies, and Regulations | No change | Discretion | NE |
| | Levee Accreditation Process | Associated levee construction, maintenance, repair, etc. would be covered by the new LOMR/LOMR-F requirements. | No discretion | NE |
| | AR Zone-A99 Determinations | Associated levee construction, maintenance, repair, etc. would be covered by the new LOMR/LOMR-F requirements. | No discretion | NE |
| Flood Insurance | Administering the Provision of Flood Insurance | | | |
| | Administer Write-Your-Own (WYO) Programs | No change | No discretion | NE |
| | Develop & Publish Insurance Rate Tables | • Subsidies on certain pre-FIRM properties (non-primary residences, business properties, severe repetitive loss properties, substantially damaged or improved properties, and properties for which the cumulative claims payments exceed the fair market value of the property) would be phased out at a rate of 25% premium rate increases per year.[1] | No discretion | NE |

| | | | | |
|---|---|---|---|---|
| | | • Subsidies on all other pre-FIRM properties would be phased out through annual premium rate increases of at least 5%, but no more than 15%, per risk classification, with no individual policy exceeding an 18% premium rate increase.[1] | | |
| | Insurance Policy Management (Issue/Sell/Renew/ Refund/Appeal) | A monthly installment plan payment option for non-escrowed flood insurance premiums would be developed.[1] | No discretion | NE |
| | Educate Insurance Agents | No change | Discretion | NE |
| | Educate and Certify Claims Adjusters | No change | Discretion | NE |
| | Adjust Loss Claims | No change | No discretion | NE |
| | Pay Valid Claims | No change | No discretion | NE |
| | Provide General Technical Assistance | No change | Discretion | NE |
| | Marketing | No change | Discretion | NE |
| NE | No effect | | | |
| 1 | Modifications required by statute | | | |

### 2.2.6 Actions Outside the Scope of the Proposed Action

Floodplain development is not an action under the NFIP. Section 7 applies to actions that are authorized, funded, or carried out by a Federal agency. Floodplain development is not authorized, funded, or carried out by FEMA (except with respect to certain grant programs outside the scope of this evaluation). FEMA has no role in the issuance, denial, or enforcement of individual permits, nor does it have the land use authority necessary to prescribe the types of development that may take place in the floodplain or to control the rate or quantity of development. As discussed above, the NFIP was designed so that floodplain management would be carried out at the State and local levels, where land use authority resides. The community regulates floodplain development through locally issued floodplain development permits. The community has the authority to issue or deny floodplain development permits. Likewise, the community monitors compliance and enforcement of individual permits. Therefore, the issuance, denial, and enforcement of individual permits are also outside the scope of FEMA's evaluation as these are not actions taken under the NFIP.

> Case Example: National Association of Home Builders v USACE
>
> In the case of National Association of Home Builders v. United States Army Corp of Engineers, a Federal court held that FEMA has no role in the approval or denial of floodplain development permits (453 F.Supp.2d 116). In that case, Plaintiffs challenged a rule published by USACE and known as General Condition (GC) 26. Among other legal challenges to GC 26, Plaintiffs argued that because GC 26 required compliance with the NFIP floodplain management regulations, it gave FEMA an improper veto authority over permits issued by USACE. The court found that FEMA has no authority to halt local floodplain development conducted pursuant to a Clean Water Act permit because of the permittee's alleged non-compliance with FEMA's minimum floodplain management regulations. The court further held that GC 26 did not change this by providing FEMA with a "veto power" over projects.

FEMA has no compliance responsibilities under the ESA with respect to private floodplain development. Figure 2.1 above shows FEMA's actions, as distinguished from the actions of the participating communities, and the role each plays in the process. FEMA is only consulting on those actions identified as FEMA's actions in Table 2-2 above.

This is consistent with interpretations taken with respect to other applicable Federal laws. For example, Executive Order 11988, Floodplain Management, states that "[e]ach agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities for (1) acquiring, managing, and disposing of Federal lands, and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities." However, Executive Order 11988, the language of which is very similar to that utilized in the ESA with respect to applicability, has never been held to apply to private floodplain development merely because it was permitted by a community participating in the NFIP. Nor has Executive Order 11988 ever been held to apply to FEMA's establishment of the minimum floodplain management criteria. For the Executive Order to apply, the Federal government must be the entity taking the action, such as when a Federal agency funds floodplain development through a grant.

Executive Order 13690 amended Executive Order 11988 and established a Federal Flood Risk Management Standard (FFRMS). As with the Executive Order it amends, Executive Order 13690 has been determined not to apply to FEMA's establishment of the minimum criteria or private floodplain development. FEMA recently issued guidance advising the public that the FFRMS does not apply to the "the minimum floodplain management criteria in 44 C.F.R. Part 60 that communities must adopt in order to participate in the NFIP…." (Federal Emergency Management Agency, 2015).

FEMA's assertions regarding the scope and limits of its Proposed Action are also consistent with judicial interpretations of other provisions of the ESA with similar language to that found in Section 7 of the ESA.

Case Example: Northern California River Watch v Wilcox

In Northern California River Watch v. Wilcox, 633 F.3d 766 (9th Cir. 2009), the court considered the meaning of the term "areas under Federal jurisdiction" as used in Section 9 of the ESA. Plaintiff River Watch argued that the term encompasses privately owned wetlands adjacent to navigable waters that have been designated as "waters of the United States" by the U.S. Army Corps of Engineers (USACE), and are, as such, subject to USACE's regulatory jurisdiction. USFWS, as amicus curiae, argued that Section 9 is ambiguous, and that the court must apply the deference principles set forth in Chevron, 467 U.S. 83, and that under Chevron, the privately-owned land at issue in this case is not an "area[ ] under Federal jurisdiction." Id. The court held:

> While we recognize that "areas under Federal jurisdiction" or "federal lands" surely includes areas under the control of the federal government, i.e. through ownership, leasehold-estates, or conservation easements, we do not interpret "areas under Federal jurisdiction" to encompass wetlands that are adjacent to navigable waters and therefore subject to only the regulatory jurisdiction of the Corps.

Id. at 782 (emphasis added). Accordingly, the court held that the requirements of the ESA applicable to USACE do not extend to private land and private parties based on the fact that they are subject to USACE's regulatory jurisdiction.

Federal courts have been unwilling to extend the requirements of the ESA applicable to Federal agencies to private land and private parties based on the fact that they are subject to the regulatory jurisdiction of a Federal agency.

Additionally, private floodplain development is not an interrelated or interdependent action. The ESA implementing regulations define interdependent actions as those actions having no

independent utility apart from the action under consideration (50 C.F.R. § 402.02). Floodplain development clearly has an independent utility apart from the NFIP, as it existed hundreds of years prior to the implementation of the NFIP, and it would continue to exist even if the NFIP no longer did.

The ESA implementing regulations define interrelated actions as actions that are part of a larger action and depend on the larger action for their justification (50 C.F.R. § 402.02). Private floodplain development is not part of the larger action of implementing the NFIP, and it does not depend on the implementation of the NFIP for its justification. As stated above, floodplain development pre-dated the NFIP, and it continues unabated even in those communities that do not participate in the NFIP. Accordingly, FEMA has no responsibility to consult on private floodplain development as an interrelated and interdependent action.

### 2.2.7 Action Area

The ESA defines the Action Area as "all areas to be affected directly and indirectly by the Federal action and not merely the immediate area involved in the action" (50 C.F.R. § 402.02). The extent of the Action Area for this BE is the limit of the jurisdictional boundaries of the NFIP participating communities, but only including those areas in the United States and its territories designated as SFHAs on a FIRM under the NFIP and nearshore marine waters[12] that may be affected by the Proposed Action.[13]

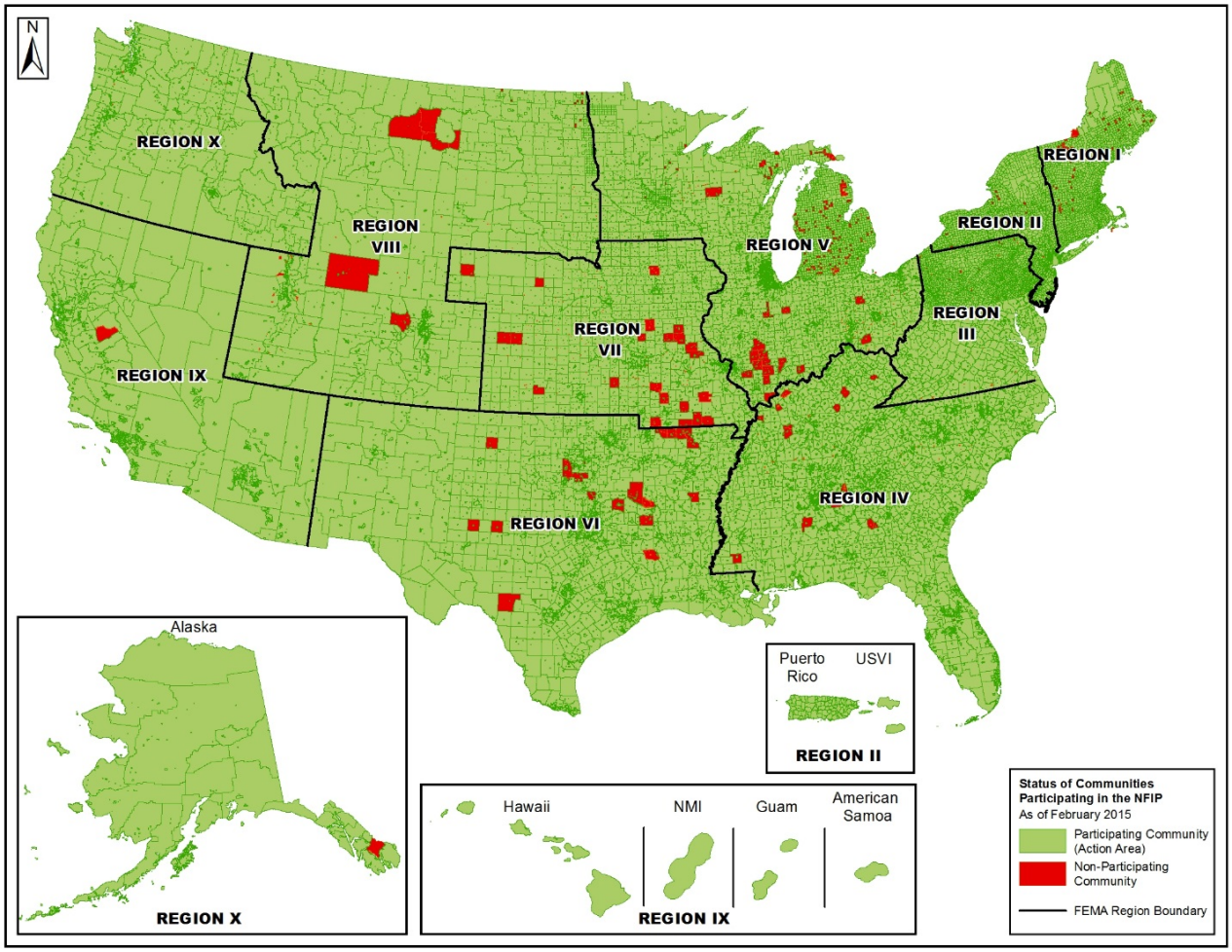
However, it should be noted that while some elements of the Proposed Action may take place anywhere within a participating community, such as the provision of flood insurance, some actions only take place within the FEMA-mapped SFHA, such as the implementation of the minimum floodplain management criteria. The SFHA is defined as "the land within the floodplain subject to a 1 percent or greater chance of flooding in any given year," often referred to as the 100-year floodplain (44 C.F.R. § 59.1). Participating communities are only required to enforce the minimum floodplain management criteria within the FEMA mapped SFHA (Federal Emergency Management Agency, 2014b). Even for actions that occur both inside and outside the SFHA, the potential effects can be quite different.

Over 22,000 communities in the United States participate in the NFIP; the Action Area of the BE is depicted in Figure 2-1. The land area covered by the floodwaters of the base flood is the SFHA on NFIP FIRMs. The SFHA is the area where the NFIP's floodplain management regulations must be enforced (Federal Emergency Management Agency, 2014b).

[12] Nearshore marine waters are defined here as waters within a few hundred feet of the shoreline.

[13] This does not include Federal lands or properties subject to Section 1316 of the NFIA.

**Figure 2-1. NFIP Participating Communities (Action Area) in the United States**



# 3 OVERVIEW OF FLOODPLAIN BASELINE CONDITIONS

This section describes existing conditions relevant to this BE and provides: (1) an overview of floodplain functions, types, and benefits; (2) a discussion of floodplain baseline conditions and how development in the floodplain affects natural and biological resources; (3) a description of habitats that are typically associated with SFHAs; (4) Federal, State, and local regulatory programs that interact with the NFIP; (5) major factors that influence floodplain development; and (6) a discussion of whether, and how, the NFIP influences floodplain development.

## 3.1 Overview of Floodplains

### 3.1.1 Floodplain Functions

A floodplain is any land area susceptible to being inundated by water from any source. Floodplains are hydrologically important, environmentally sensitive, and ecologically productive areas within a watershed that perform many functions. FEMA describes flooding as a general and temporary condition of partial or complete inundation of two or more acres of normally dry land area or of two or more properties (at least one of which is the policyholder's property) from: (1) overflow of inland or tidal waters; (2) unusual and rapid accumulation or runoff of surface waters from any source; (3) mudflow; or (4) collapse or subsidence of land along the shore of a lake or similar body of water as a result of erosion or undermining caused by waves or currents of water exceeding anticipated cyclical levels that result in a flood as defined above (Federal Emergency Management Agency, 2014a).

Flooding is a natural phenomenon of rivers and coastal environments, and is extremely important to the maintenance of floodplain ecosystems and channel stability. Floodplain environments are dynamic in nature and, given their proximity to water and the presence of fertile soils and nutrients, are highly productive biological communities. Floodwaters carry nutrient-rich sediments and trigger chemical processes that cause beneficial changes in the soil, contributing to a fertile environment for vegetation. Floodwaters enhance biodiversity by creating a variety of habitats, including breeding areas for fish and wildlife. In addition, floodplains provide flood storage and conveyance, protection of water quality, and recharge of groundwater functions (Federal Emergency Management Agency, 2002).

### 3.1.2 Floodplain Types

Floodplains contain a wealth of cultural and natural resources that are of enormous value to society (Federal Emergency Management Agency, 2002). Floodplains are described as riverine or coastal depending on their location. Riverine floodplains include palustrine forested, scrub-shrub, and emergent wetlands. Coastal floodplains include palustrine and estuarine wetlands, barrier islands, rocky intertidal shores, and marshes.

*Riverine.* Riverine systems vary in steepness, width, flow, sediment deposition, and erosion capacity. This becomes readily apparent in the transitions from narrow headwater streams to lower gradient streams with wider floodplains. The frequency, duration, and extent of flood events will vary among different types of floodplains, dependent on their hydrology, geomorphology, and amount of floodplain development. Floodplains are formed and modified by periodic flooding and the dynamics of stream and river migration and periodic flooding. Riverine floodplains can experience multiple flood events within the same year with durations varying from hours to days. Periodic flooding of riverine systems and the related processes of erosion and deposition determine the shape of the floodplain; depth and composition of soils (e.g., often alluvial organic soils); type and density of vegetation; presence and extent of wetlands; richness and diversity of wildlife habitats; and depth to groundwater. (Federal Emergency Management Agency, 2002)

The major flood conveyance component of riverine floodplains is the floodway. The NFIP defines the floodway as that area of the watercourse and adjacent floodplain necessary to carry the base flood without increasing the water surface elevation more than a designated amount. The base flood is the flood that has a 1 percent chance of being equaled or exceeded in a given year. Subject to certain exceptions, communities participating in the NFIP may only allow development within the floodway that would not cause an increase in flood heights. This requirement has the effect of limiting development in floodways that in turn helps to maintain some of the floodplain's most important natural resources and functions (Federal Emergency Management Agency, 2002). The flood fringe refers to the outer portions of the floodplain, beginning at the edge of the floodway and continuing outward. As described in Section 1.1, the land area covered by the floodwaters of the base flood is the SFHA on NFIP maps. The SFHA is the area where the NFIP's floodplain management regulations must be enforced and the area where the mandatory purchase of flood insurance applies (Federal Emergency Management Agency, 2014b).

*Coastal.* Coastal floodplains provide habitat for marine and estuarine organisms, many of which are of significant ecological and economic value. Coastal beaches, dunes, banks, and tidal flats all play roles in protecting the land from destructive coastal storms, such as hurricanes. In coastal systems, aside from major storm events where waves may overrun large areas, inundation follows a largely predictable tidal cycle. The specific characteristics of a coastal floodplain such as geographic location, contributing sediments, and whether the floodplain has been modified or remains relatively pristine, can alter the way storms and resulting floodwaters will impact the area. (Federal Emergency Management Agency, 2002)

The configuration of a coastal floodplain is largely determined by underlying geology, sediment supply, and wind and wave energies. Sedimentary coastal floodplains, such as cobble, sand, and silt beaches, adjust to storm energies during an extreme event and then rapidly readjust to normal patterns. Long term more permanent shoreline changes can result from changes in sediment supply, sea level rise, or changes in predominant wind and wave direction. The classic example of this long term change is the "rolling over" of a barrier island which migrates towards or away from the mainland over geologic time as sea level and sediment supply change. (Federal Emergency Management Agency, 2002)

Coastal floodplains protect and maintain the resources that exist along both the shores and inland, including beaches, barrier islands, rocky intertidal shores, salt marshes, and wetlands. Also included are humans and human elements such as housing and roads. The coast's primary defense against wave energy is shallow near shore ocean bottoms. Energy-intensive storm waves cause beach sediment to move offshore to subtidal areas, resulting in a reduced coastal beach volume and a gentler slope. Coastal dunes on barrier islands constitute the major portion of the total volume of a barrier island that is visible above high water. On retreating shorelines, the coastal dunes bordering the beach migrate landward, either over a gradual period from tidal and wave influences, or very rapidly, as in the event of a major storm. The erosion of coastal dunes by waves, usually during storms, supplies sand to the adjacent coastal beaches or shallow waters. Without this supply of sediment, beaches will gradually be depleted, either migrating or disappearing from the onshore sediment system. The volume and form of coastal dunes provides a buffer that resists wave run-up during storms and retards shoreline retreat. Vegetation contributes to the growth and stability of coastal dunes by providing conditions favorable to sand deposition and stability. (Federal Emergency Management Agency, 2002)

Estuarine wetlands provide important for breeding, nursery, and feeding grounds for marine fisheries and coastal floodplains are important habitat for waterfowl and other wildlife. Shallow coastal areas such as estuaries, tidal flats and rivers, and beaches support significant for shellfish, reptiles, and other finfish. Rivers, creeks, and lakes that have an unimpeded connection to the sea provide breeding and feeding grounds for a variety of coastal marine life. The water quality

in these areas is affected by changes in sediments, salinity, nutrients, oxygen, temperature, and the addition of various pollutants. (Federal Emergency Management Agency, 2002)

Barrier islands and coastal banks play an important role in storm damage prevention and flood control. Barrier islands provide one of the strongest coastal defenses against shoreline erosion through their natural processes of roll and migration. Barrier islands hinder wave action and storm overwashes. Coastal banks have the ability to adjust in response to wave action, which allows them to supply sediment to coastal beaches, coastal dunes, barrier beaches, and land under the ocean. They provide a natural resistance to erosion caused by wind and rain runoff, acting as a vertical buffer to stormwaters and waves. (Federal Emergency Management Agency, 2002)

Rocky intertidal shores act in much the same manner as coastal beaches. The sloping shorelines and/or boulders dissipate wave energy and serve as natural buffers from the sea for the land behind the rocky intertidal shore. Rocky intertidal shores also play an important role in the protection of fish and shellfish. (Federal Emergency Management Agency, 2002)

Marshes provide important habitat for marine fish and shellfish. Salt marshes are extremely productive natural systems and a source of large volumes of organic material for the ocean and estuaries that support extensive marine food chains. The chemical characteristics of estuarine waters, particularly the levels of nutrients, dissolved oxygen and biological oxygen demand, are modified each time estuarine waters flush a salt marsh area. Salt marshes act to reduce pollution of the coastal zone by removing excess nutrients and heavy metals delivered by surface runoff from upland areas. Marshes also play an important role in storm damage prevention and groundwater supply. Marsh vegetation and underlying peat are resistant to erosion and dissipate wave energy, thus providing another coastal zone defense against wave damage. Marshes help to slow water flow and spread it out during periods of inundation until it gradually returns to the sea or estuary. (Federal Emergency Management Agency, 2002)

### 3.1.3 Floodplain Benefits

Floodplains perform a variety of essential functions including floodwater conveyance and storage, groundwater recharge, wave attenuation, stream bank erosion control, reduction in sedimentation rates, water quality maintenance, and support of highly productive ecosystems. Flooding from hurricanes and storms is the key process in providing such tangible benefits as increased soil fertility, wetland creation, rejuvenation of spawning gravel, creation of barrier islands, promotion of aquatic habitat, transportation of large woody material that provides fish habitat and bank stability, promotion of plant establishment, and the evolution of channels and shoreline features such as dunes (Association of State Floodplain Managers, 2008a). Benefits to humans are also provided in the form of sites for various types of water dependent development and recreational opportunities as well as cultural and scientific values. Some benefits provided by floodplains are static in nature (e.g., providing aesthetic pleasure) and some are dynamic processes (e.g., filtering nutrients). A summary of the natural and societal benefits of floodplains is included in Table 3-1.

*Water Resources.* Flood conveyance and floodwater storage are among the primary natural functions of floodplains. Hydrology is the dominant characteristic of floodplains that drives the dynamics of the entire system. Floodplains receive and store water from (1) excess stream flow that exceeds the capacity of the channel; (2) surface runoff from the surrounding watershed; and (3) direct precipitation. The generally flat nature of natural floodplains is favorable for local ponding and flood detention, and the permeable nature of alluvial soils promotes infiltration into the subsurface for storage in soils and aquifers. (Federal Emergency Management Agency, 2002)

Floodwater that exceeds the conveyance capacity of the waterway is stored in floodplains for varying periods of time after a precipitation event and flows to the watercourse gradually, either

as surface or subsurface (groundwater discharge) flow. The floodplain's natural capacity for flood storage and conveyance serves to reduce flood velocities and peak flows in stream channels. Floodplain vegetation also plays an important role in determining the flow patterns and the velocity at which water flows across the land. Floodplains generally provide an expansive area where floodwaters can slow and disperse over a broader area. Decreased velocities can increase the lag time of a flood (i.e., the time between the middle of the rainfall event and the flood peak), and minimize the magnitude of flooding and the potential for flood-related damage. Additionally, decreasing floodwater velocities will reduce erosion and subsequent sedimentation in other areas such as the stream channel (Federal Emergency Management Agency, 2002).

**Table 3-1: Benefits of Floodplains**

| Water Resources | Biological Resources | Societal Resources |
|---|---|---|
| Natural Flood and Erosion Control<br><br>• Provides flood storage and conveyance<br>• Reduces flood velocities<br>• Reduces peak floods<br>• Reduces sedimentation<br><br>Water Quality Maintenance<br><br>• Filters nutrients and impurities from runoff<br>• Processes organic wastes<br>• Moderates temperature fluctuations<br><br>Groundwater Recharge<br><br>• Promotes infiltration and aquifer recharge<br>• Reduces frequency and duration of low flows | Biological Productivity<br><br>• Supports high rate of plant growth<br>• Maintains biodiversity<br>• Maintains integrity of ecosystem<br><br>Fish and Wildlife Habitats<br><br>• Provides breeding and feeding grounds<br>• Provides and enhances waterfowl habitat<br>• Protects habitats for ESA species | Harvest of Wild and Cultivated Product<br><br>• Enhancement of agricultural lands<br>• Provides sites for aquaculture<br>• Restores and enhances forest lands<br><br>Recreational Opportunities<br><br>• Provides areas of active and passive use<br>• Provides open spaces<br>• Provides aesthetic pleasure<br><br>Areas for Scientific Study / Education<br><br>• Cultural Resources (historical / archaeological)<br>• Opportunities for environmental, biological, or other studies |

Source: (Federal Emergency Management Agency, 2002)

The groundwater-surface water interaction helps to naturally regulate flow regimes of rivers, streams, and lakes. During periods of abundant flow, water enters the groundwater system rather than contributing to seasonal floods. Diminishing extreme variations in flow levels improves the capacity of the water body to support a diversity of wildlife and provide recreational benefits. (Federal Emergency Management Agency, 2002)

Vegetated floodplains control erosion and sedimentation of streams and other water bodies by stabilizing riverbanks and filtering runoff. Water is naturally cleansed through the processes of filtration, ion exchange, adsorption, absorption, and aerobic biological actions that take place in the floodplain. These natural processes reduce the levels of pathogens and toxic substances that enter the water body, while at the same time retaining the nutrients within the floodplain soils. Vegetative floodplains also protect waterways, wetland areas, and riparian zones from excessive erosion and sedimentation by slowing the velocity of stormwater, allowing for the deposition of sediments on land and by binding the soil. (Federal Emergency Management Agency, 2002)

*Biological Resources.* The nation's coastal and riverine floodplains support and promote biological productivity and often contain large and diverse populations of plants and animals contributing to the diversity and integrity of adjacent downstream ecosystems. Nutrients and

energy that enter rivers and streams are carried downstream into larger water bodies. Many plant species indigenous to floodplains are adapted to thrive in the specific conditions created by the soil types and water regimes that characterize river corridors. Floodplains may contain the only suitable environment for growth of some species of vegetation, which foster breeding/spawning of species of fish and wildlife. (Federal Emergency Management Agency, 2002)

The diverse vegetation in floodplains provides habitat for wildlife, controls erosion, and sedimentation, and improves water quality by filtering pollutants. Floodplains often contain different zones of vegetation, with shallow aquatic vegetation changing gradually to trees and shrubs in upland areas. The diverse vegetation of floodplains can support a wide variety of wildlife and smaller organisms feeding on plants. Trees and shrubs in more upland areas provide food, protection, nesting, and roosting areas for many species. In addition, fallen branches and root masses create macro- and micro-habitats among the pools, breaks, and riffles in the stream. The shading effect of riparian vegetation is beneficial for avoiding temperature extremes that stress natural biota. The warming of surface water due to the removal of streamside vegetation also lowers dissolved oxygen levels in the water, making it more difficult for aquatic species to migrate, reproduce, or fulfill their expected life cycles. (Federal Emergency Management Agency, 2002)

Wetlands also serve as an important component of the floodplain environment; wetlands act as a natural buffer against flooding by storing and slowly releasing floodwaters. Wetlands also protect water quality by filtering pollutants and sediments from surface runoff. Wetlands provide habitats for fish, shellfish, waterfowl, and a wide variety of other aquatic and semi-aquatic species. USFWS estimates that up to 60-70 percent of threatened and endangered animal species rely on wetlands for habitat. (Federal Emergency Management Agency, 2002)

Biological resources are floodplain resources and functions that benefit large and diverse populations of plants and animals. Historically, biological productivity (including high rates of plant growth, maintaining biodiversity, and maintaining integrity of the ecosystem), and fish and wildlife habitats (including breeding and feeding grounds, enhanced waterfowl habitats, and habitats for rare and endangered species), have been two of the primary biological benefits of maintaining natural floodplains. (Federal Emergency Management Agency, Undated)

*Societal Benefits.* In addition to the natural functions, floodplains provide values to humans that enable society to enjoy and interact with their natural surroundings. Floodplains provide cultural, educational, recreational, and scenic values that extend beyond a specific floodplain to enrich communities along entire rivers and coasts. In some areas, floodplain lands constitute the only public land base available to nearby residents for passive and active recreation. (Federal Emergency Management Agency, 2002)

Floodplains contain cultural resources important to the nation and to individual localities. Native American settlements and early cities located along the coasts and rivers for access to water supply, waste disposal, water transportation, and trade. Due to their flat topography, floodplains were travel corridors for human movement. Consequently, floodplains include many of the nation's earliest archaeological and historical sites. In addition to their historical richness, floodplains contain invaluable resources for scientific research. Floodplains can serve as nature study centers and laboratories for outdoor learning experiences. (Federal Emergency Management Agency, 2002)

Due to their scenic value and recreation opportunities, floodplains are ideal locations for parks and numerous outdoor activities, such as water-oriented sports, boating, swimming, hiking, and camping. Floodplain wildlife resources can be managed for observation as well as for recreational hunting and fishing. Finally, natural floodplains can be valuable as constituents of the "wilderness experience," an important aspect of American culture. (Federal Emergency Management Agency, 2002).

## 3.2 Floodplain Conditions

### 3.2.1 Existing Floodplain Conditions

As defined in 44 C.F.R. § 59.1, a floodplain is "any land area susceptible to being inundated by water from any source" and as "a general and temporary condition of partial or complete inundation of normally dry land areas from 1) the overflow of inland or tidal waters…2) the unusual and rapid accumulation or runoff of surface water from any source." The NFIP provides communities with maps that show areas that are likely to flood, or FIRMs. For purposes of the NFIP, the mapped flood height is the base flood elevation, or "the flood having a one percent chance of being equaled or exceeded in any given year" (44 C.F.R. § 59.1).

Floodplains are not uniform and vary in size and conditions by State. For U.S. streams, the average floodplain width can range from 3 meters for small rivers to about 1 kilometer for larger rivers.

Over the NFIP's history, flood claim losses due to riverine floods and hurricane events have been concentrated in Texas, Florida, and Louisiana, with concentrations of non-hurricane flood claim losses in Texas and Louisiana. Repetitive flood claim losses are also concentrated in a few other States (such as New York, New Jersey, and Mississippi) (Galloway, et al., 2006). Physical floodplain conditions differ from one location to another across the nation. Some floodplains are subject to flash floods or fast rising floodwaters, and others face floods that arrive slowly and can be forecast days (or even weeks) beforehand. In some areas, the difference between the 1-percent and the 0.2-percent flood is a matter of inches and the extent of the 0.2-percent floodplain is only slightly larger than the 1-percent floodplain. In other cases, the vertical difference may be a matter of feet and the areal difference very large (Galloway, et al., 2006).

In an attempt to transport floodwaters more efficiently through a watershed, modifications to naturally existing floodplains through structural interventions such as concrete lining, revetments, floodwalls, jetties, diversions, dams, and reservoirs, and through reshaping the landscape for agriculture and development, have altered the natural floodplain landscape with very few unaltered floodplains remaining in the United States. As a result, the physical attributes, such as vegetation and ground surface that shape the floodplain, are disturbed leading to changes in the natural movement of water (e.g., changes in speed and sediment load). (Association of State Floodplain Managers, 2008b)

Floodplain degradation is caused by altering the landscape of the floodplain. In comparing the amount of degradation between different floodplains, the geology type is a substantial factor. Areas with fine particles of silt and clay are more likely to erode, and the sedimentation aggrandizes downstream. Erosion is caused by many factors, including development, mining, agriculture, and other activities (Federal Emergency Management Agency, 2002). Additionally, the presence of water storage and debris basins changes the landscape downstream: dams reduce the upstream supply of recharging sediment and result in a higher rate of erosion even though the water flows slower (RBF Consulting, 2014).

### 3.2.2 Threats to Species and Habitats in Floodplains

Many factors influence threatened and endangered species populations and their habitats. Common threats that occur among the different identified species groups and habitats include floodplain development, invasive species, diseases, parasites, predation, hunting/fishing/overexploitation, and climate change.

#### 3.2.2.1 Floodplain Development

Floodplain development is not an action under the NFIP, and, FEMA does not have any appreciable influence on the rate or quantity of development in floodplains. However, floodplain development can have significant effects on ESA species, designated critical habitats, or EFH, and the NFIP is a potential tool that FEMA can utilize, as required by Section 7(a)(1) of the ESA, to address these adverse impacts to ESA species. General effects of development in floodplains are analyzed in this section by assessing the following four types of effects: (1) habitat loss, fragmentation, degradation, and disturbance; (2) degradation of water quality; (3) changes to hydrology, erosion, and sediment transport; and, (4) degradation or removal of movement and migration corridors (Environmental Protection Agency, 1993) (McGarigal, Cushman, & Regan, 2005).

Habitat loss, fragmentation, degradation, and disturbance are the result of incremental conversion of natural lands to agricultural, residential, commercial, or industrial uses, including mineral extraction. In addition to direct habitat loss within the construction footprint, degradation to surrounding natural lands may occur from erosion or through the introduction of non-native plants and animals, including domestic animals. Habitat fragmentation increases the amount of edge habitat and decreases the amount of core or interior habitats. The edge habitats produced by fragmentation from development often lack the transition zones found in natural habitat edges, reducing overall habitat functionality (Environmental Protection Agency, 1993) (McGarigal, Cushman, & Regan, 2005) and can increase predation and the risk of parasitism by other species (U.S. Fish and Wildlife Service, 1999f).

Changes to water quality in nearby bodies of water often occur as a result of development. These changes include increases in turbidity from erosion; increases in water temperature from removal of overhanging vegetation; and pollution in the form of non-point source runoff of contaminants from roadways, parking lots, and lawns and point-source contaminants from wastewater treatment plants and industrial activities (North Carolina State University, 1995). Contaminants include pesticides, metals, petroleum products, pharmaceuticals, and household soap/detergent products. In terms of ESA-listed species and designated critical habitats, water quality degradation provides the greatest threat resulting from pollution. Pollution sources may be point (end-of-pipe) or non-point (runoff), and may be current or historical. Pollutants resulting in water quality degradation result from a variety of causes, including agriculture, mining, petroleum exploration, and the manufacturing of chemicals. USFWS estimates that approximately one third of all native freshwater mussels are either extinct or listed as endangered or threatened, many a result of impaired water quality (U.S. Fish and Wildlife Service, 2015a).

Development may also cause changes to hydrology, erosion, and sediment transport. For instance, channelization of waterways and installation of hardened banks can alter flows, direct flood energy to other areas, and affect sediment transport; the resulting changes in substrates, flow rates, and depths may alter aquatic habitats (North Carolina State University, 1995). As an example, straightening a bend in a waterway increases flow velocities, which increases the scour of finer substrates, leading to an overall coarsening of substrate and channel incision. Alternatively, deepening and widening of a waterway decreases flow velocities and allows for the settling of finer substrates, leading to siltation.

The degradation or removal of migration corridors occurs as a synergy of the habitat changes described above. As habitat and vegetative cover are fragmented by development, movement becomes more difficult and exposes species to greater risks, such as collisions with vehicles and predation by both natural and domestic predators (McGarigal, Cushman, & Regan, 2005). Fencing, retaining walls, and curbs may constitute barriers to some terrestrial animals. For aquatic animals, the installation of dams for flood control or water diversions may prevent the upstream movement of fish and other aquatic organisms. Plant populations may also be affected

because intervening areas of unsuitable habitat may prevent populations from spreading or re-colonizing areas from which they have been extirpated (Environmental Protection Agency, 1993).

#### 3.2.2.2 Invasive Species

An invasive species is a species introduced to an ecosystem to which it is not native and which is likely to cause environmental or economic harm or harm to human health (Executive Order 13112, 1999). Invasive species often cause harm to existing native species. Invasive species may be native or nonnative (exotic) and introduced intentionally, such as for pets or biocontrol, or unintentionally, such as in ballast water, hidden within vegetation, or other pathways. Invasive species can disturb natural communities and ecosystems by changing the composition and quality of habitat; reducing stream flows; degrading water quality and changing water temperatures; displacing and/or causing major alterations of native plant communities including composition of the understory; competing for habitat resources including food, water, cover, or breeding/nest sites; disrupting the food chain; increasing soil erosion; and increasing wildfire potential. Invasive species can harm and prey on native species, leading to declines in native populations (U.S. Fish and Wildlife Service, 2012b). Crossbreeding between native and invasive species can lead to genetic concerns; for example, recent evidence suggests the endangered Hawaiian duck breeding with the feral Mallard ducks (U.S. Geological Survey - University of California Davis, 2007). Invasive species are often part of the reason native species are listed as threatened (U.S. Fish and Wildlife Service, 2012b). According to the EPA, invasive species represent the second leading cause of species extinction and loss of biodiversity in aquatic environments worldwide (Environmental Protection Agency, 2015a) (Environmental Protection Agency, 2015a).

Native species are most likely to be adversely affected by introduced species (referred to as exotic invasives) that grow and reproduce quickly and spread aggressively. Exotic invasives can rapidly colonize an area and become serious pests, often because they are no longer controlled by predators or diseases that limit their numbers in their native habitat (University of California Integrated Pest Management Program, 2015). An example is feral (wild) pigs in California that overturn native vegetation as they dig for food; this rooting also damages the habitat of animals that live on or under the ground such as amphibians, reptiles, mammals, and ground-nesting birds. One researcher found that almost 100 species identified as threatened, endangered, or rare are exposed to rooting and other feral pig activities (University of California Integrated Pest Management Program, 2007).

Competition with exotic invasives can be especially damaging to native wildlife if diet or cover requirements are similar and the habitat is at carrying capacity. In this situation, native populations may decline if they are unable to adapt to the stress of habitat depletion caused by the introduced species. For example, in response to a reduced food supply, exotic invasives may be able to shift to foods that are less preferred but more available. If native species cannot do the same, the native species will not compete well for available resources (Traweek & Welch, 1992).

Invasive species may also cause environmental harm by causing changes in ecological processes, sometimes across entire regions, resulting in conditions that native species and even entire plant and animal communities cannot tolerate. For example, some non-native plants can change the frequency and intensity of wildfires, or alter the hydrology or rivers, streams, lakes and wetlands. See Invasive Species Definition Clarification and Guidance White Paper, Invasive Species Advisory Committee (April 27, 2006).

> Example: Non-native Eucalyptus
>
> In Oakland, California, the introduction of non-native eucalyptus as ornamental vegetation has significantly increased the risk of wildfire and the potential to destroy habitat for the endangered Alameda whipsnake (Federal Emergency Management Agency, 2014e)

#### 3.2.2.3 Parasites/Diseases

Parasite-caused diseases have become increasingly common and can pose significant risks to natural populations. Most wild mammal species threatened by parasites are either carnivores or artiodactyls (cloven-hooved mammals); these groups also include the majority of domesticated and companion animals. Mammals that are closely related to domesticated animals are at the greatest risk. In addition, parasites can infect a wide range of domestic host species and close contact between domestic animals and endangered wildlife species is a major route of transmission for these harmful parasites. For example, domestic dogs can infect wolves or foxes with the canine distemper virus. Diseases, especially in small or already fragmented populations, may compromise a threatened or endangered animal population by suppressing population growth rates or by killing individuals more rapidly than they can reproduce (Pedersen et al., 2007).

Introduced exotics (invasive species) of plants and animals may carry harmful diseases or parasites from which native species may not have immunity (Traweek & Welch, 1992). Native wildlife can carry parasites that adversely affect threatened or endangered species. For example, white-tailed deer are the main host for a parasite that causes "brain worm," a severe debilitating neurological disease. Deer carry the parasite but have few, if any, signs of illness; however, the disease is fatal to the endangered woodland caribou (Woodbury, Undated) (Washington Department of Fish and Wildlife, 2012). Diseases caused by or carried by invasive species are particularly threatening, as native wildlife may have no natural immunity to them.

Although plant diseases are not typically the sole or primary cause of species extinctions, over the past 100 years forest disease has caused significant declines in North American canopy trees and restructured forest ecosystems on a large scale, which may adversely affect threatened or endangered species (Cobb, Filipe, Meentemeyer, Gilligan, & Rizzo, 2012).

Example: Diseases Threatening U.S. Wildlife

The following are a few of the many diseases threatening U.S. wildlife:

• Chytrid Fungus: *Batrachochytrium dendrobatidis* (Bd) is a fungus that grows on the skin of amphibians, interfering with their ability to breathe or take up water through their skin. In most places, almost as soon as Bd is detected at a new site, the frogs begin dying off. In a period of a few months, frog populations can go from abundant to nearly nonexistent. Most mass die-offs occur soon after frogs transform from tadpoles into frogs, leaving pond or stream shorelines littered with dead frogs. In some places, frogs may be infected even though die-offs are not observed. (National Park Service, 2015)

• Fibropapillomatosis: Sea turtles worldwide are becoming infected with this disease, which causes tumors to appear on the skin or internally. These tumors can make it difficult for a turtle to swim, eat, or see, and can weaken their immune systems. (Klein, 1995)

• White-nose Syndrome: Since 2007-2008, millions of insect-eating bats in 25 States and 5 Canadian provinces have died from the white-nose fungus, *Pseudogymnoascus destructans*, which infects the skin of muzzles, ears, and wings of hibernating bats. The disease affects hibernating bats, making them appear to have a white substance on their faces and wings. Infected bats often display abnormal behaviors in their hibernation sites, such as movement toward the mouth of caves and daytime flights during winter. These abnormal behaviors may contribute to the untimely consumption of stored fat reserves causing emaciation, a characteristic documented in a portion of the bats that die from white-nose syndrome. (U.S. Geological Survey - National Wildlife Health Center, 2015)

• Chronic Wasting Disease (CWD): This disease is a highly contagious, fatal neurological disease (spongiform encephalopathy) that infects primarily deer and elk. The disease is believed to be caused by a modified protein called a prion, which infects the host animal by converting a normal protein to the abnormal one. CWD causes a spongy degeneration in the brains of infected animals, resulting in emaciation, abnormal behavior, loss of bodily functions, and ultimately death. (Virginia Department of Game and Inland Fisheries, 2015)

• Whirling Disease: Trout, salmon, and whitefish in 25 States have been infected by the parasite *Myxobolus cerebralis* that causes whirling disease. This parasite damages nerves and cartilage, causing young fish to die and older fish to swim in an uncontrolled whirling motion, making it difficult for them to find food and increasing their vulnerability to predators. (Montana Water Center, 2012)

• Sylvatic Plague: Prairie dogs are highly susceptible to this bacterial disease, which is transmitted by fleas. The endangered black-footed ferret is at even greater risk from the effects of the disease, because not only can the disease infect it, but prairie dogs are also its primary food source. (U.S. Geological Service - National Wildlife Health Center, 2013)

#### 3.2.2.4 Predation

Predation affects many threatened and endangered species, for which the loss of a very few individuals may have a greater impact due to smaller populations. Predators of endangered species may be exotic or native species. In Florida, for example, native but over-abundant raccoons and nonnative armadillos both prey on sea turtle eggs in beach nest areas. Other significant predators of rare species include domesticated or feral cats and dogs (Engeman, Constantin, Gruver, & Ross, 2009).

Predation by large, native carnivores (such as black and grizzly bears, wolves, cougars, and wolverines) is the major natural cause of mortality for all ungulates (hooved mammals), including threatened and endangered species. Predator populations naturally increase in response to a corresponding increase in prey species. Increased predation can have a more significant effect on species with lower population numbers. For example, when moose populations expanded into areas historically occupied by woodland caribou, wolf populations increased in response to a larger prey base, which in turn led to increased predation on caribou (Mountain Caribou Science Team, 2005).

#### 3.2.2.5 Hunting/Fishing/Overexploitation

Hunting, fishing, and overexploitation of species have occurred for centuries. Humans depend on plants and wildlife for a variety of necessities, such as food, shelter, clothing, medicine, and other needs. Illegal hunting (or historical legal overhunting) for sport or to protect livestock continue to threaten large carnivores (NatureServe, 2009c) (Northern Continental Divide

Ecosystem, 2013). Commercial and recreational fishing can result in entrapment or entanglement of threatened or endangered marine mammals and sea turtles in fish or shrimp nets, monofilament line, and other fishing gear (U.S. Fish and Wildlife Service, 2001c). Overexploitation occurs when humans hunt or fish to the extent that species population levels become unsustainable. Humans hunted the passenger pigeon to extinction by the early 1900s; overhunting nearly caused the extinction of several whale species and the American bison until the enactment of the ESA and protective measures (U.S. Fish and Wildlife Service Pacific Southwest Region, 2013) (Braham, 1984) (U.S. Fish and Wildlife Service Wichita Mountains Wildlife Refuge, 2014).

Large mammal species are frequently hunted for their fur, food, sport, and for their antlers, horns, or tusks. Illegal hunting of large mammals for their body parts threatens species, such as tigers, bears, and rhinoceros. Birds are collected or hunted for sport, food, and as pets (particularly parrots and songbirds) with many species threatened to extinction. Reptiles are collected or harvested for their skins or shells, eggs, food, and as pets (such as the box turtle). Reptile skins (e.g., python and crocodile) are prized and highly valued for trade. Marine invertebrates seem particularly resistant to overfishing, primarily because their relative immobility and scattered concentrations creates refuge populations. Overfishing concerns for invertebrates arise primarily for those species where price is sufficiently high to encourage illegal fishing or where harvest by the fishing industry is not easily monitored or controlled (Jamieson, 1993).

Woodland caribou historically ranged throughout much of Canada and the northeastern, north-central, and northwestern U.S., but the southern limit of their range has receded considerably due, in part, to overhunting; the species is now endangered (Washington Department of Fish and Wildlife, 2012).

Example: Hunting, Fishing, and Overexploitation Activities Threatening U.S. Wildlife

• Fish and Other Aquatic Species: Overfishing is the primary driver in the decline of worldwide populations of fish and other aquatic species. Overexploitation is a persistent problem due to the typical slow response of fish populations to fishing restrictions and the general tendency to overfish immediately following apparent increases in fish populations (Rosenberg, 2003).

• Birds: Several bird species are threatened or have gone extinct due to hunting and habitat destruction (BirdLife International, 2012). While hunting for birds often occurs as a sport, the Passenger Pigeon was hunted to extinction during the 19th century for food as it was a good source of protein (Yeoman, 2014).

• Mammals: Human activities, including hunting, are currently contributing to the decline of nearly 25% of mammals, such as threatened mammals (rhinoceroses, elephants, tapirs, jaguars, and various primates). For example, between 1970 and 1992, black rhinoceros numbers dropped 96% due to hunting. International agreements to protect species are largely ineffective given that few countries have resources to pursue poachers or the illegal trade in wildlife (Worldwatch Institute, 2015).

• Amphibians: Amphibians can be exploited for a variety of uses, including food, pets, medicine, educational purposes, research, and fish bait. Overharvesting has had devastating effects on amphibians in the United States, such as the California red-legged frog, which was exploited heavily between the late 1840s and early 1900s. By the mid-1870s, their numbers had been significantly depleted in parts of California. Although this species is no longer harvested, it is listed as federally threatened due to overharvesting more than a century ago (Amphibiaweb, 2003).

• Reptiles: Researchers blame unsustainable hunting and harvesting as one of the greatest threats to reptile species in the U.S. Commercial harvesting is considered the second greatest threat to reptiles. For example, in one year, Louisiana shipped 40,000 box turtles overseas as pets. In 1980, an estimated 115,000 leatherback turtles were in existence worldwide, but that number dropped to 30,000 by 1995 due to exploitation in the Atlantic Ocean. Interpol estimates that the annual illegal wildlife trade approaches $6 billion, with reptiles such as the Komodo dragon selling for nearly $20,000 (Gianaro, 2000).

• Invertebrates: Marine invertebrates seem particularly resistant to overfishing, primarily because their relative immobility and scattered concentrations creates refuge populations. Overfishing concerns for invertebrates arise primarily for those species where price is sufficiently high to encourage illegal fishing or where harvest by the fishing industry is not easily monitored or controlled (Jamieson, 1993).

• Plants: Plants are harvested for food, medicinal purposes, building materials, and in their natural form. Harvesting plant species is sustainable when plant populations can grow sufficiently to replenish the stock taken; when harvested in excess, however, the plant resource is unable to regenerate fast enough for the population to recover. Sometimes whole individuals are taken (as when logging for timber), but in other cases just parts of plants are used. In the case of mahogany tree harvesting, exploitation can affect a species' genetic composition. Mahogany trees take over 100 years to mature, and sustainable harvesting would only take a small percentage of the standing trees. However, general practice has been to extensively log the straight trees for timber, leaving non-straight trees as the only ones to reach maturity and reproduce (Botanic Gardens Conservation International, 2015).

#### 3.2.2.6 Extreme Weather Events and Climate Change

Extreme weather events include tropical storms, heavy precipitation, flooding, tsunamis, volcanic eruptions, landslides, earthquakes, wildland fires, heat waves, and droughts, all of which may adversely affect threatened and endangered species by direct mortality or by intensifying existing stresses on threatened and endangered species (U.S. Climate Change Science Program, 2008). Hurricanes and severe flooding can scour areas removing plants and topsoil, and may introduce stored or stockpiled contaminants into waterways when developed areas are flooded (North Carolina State University, 1995). Although sudden extreme events such as flash floods capture the public's attention and can have serious consequences on species, the slower, more long-term extreme weather related to climate change, such as drought, are equally threatening to endangered species and their habitats (U.S. Geological Survey, 2007).

Climate change can potentially cause abrupt changes to habitat and ecosystems, and may be a threat to many threatened or endangered species. Notably, climate change is affecting the migration of songbirds; breeding birds' arrival dates are changing, often occurring before the necessary food supply is available. Climate change has exacerbated wildfires, insect outbreaks, pathogens, coral bleaching, disease outbreaks, and tree mortality. Higher water temperatures

resulting from climate change may impact cold and cool water fish, and rising sea levels affect many fish and wildlife habitats (U.S. Fish and Wildlife Service, 2012a).

Example: Climate Change affects Species in some U.S. Regions more Severely than Others

Arctic species are especially at risk because the Arctic is warming at about twice the global average. By the year 2050, the average Arctic temperatures are expected to rise by approximately 2° C from 2015 levels. The rapid rates of warming in the Arctic dramatically reduce the snow and ice covers that provide denning and foraging habitat for polar bears and other Arctic species (Arctic Monitoring and Assessment Programme, 2015).

The length of the growing season has increased more rapidly in the west than in the east. The western U.S. has seen an increase of about 2.2 days per decade since 1895, compared with a rate of almost one day per decade in the east (Environmental Protection Agency, 2015b).

Increased runoff in eastern regions may cause little change in the Missouri and lower Mississippi Rivers, but may lead to substantial decreases in annual runoff in the interior of the west (Colorado and Great Basin). The west and southwest have experienced increased drought conditions throughout the 20th century. In arid lands, changes in temperature and precipitation will very likely decrease the vegetation cover that protects the ground surface from wind and erosion, threatening species that occur there (U.S. Climate Change Science Program, 2008).

Along the eastern coast of the U.S., climate change is linked to increased shoreline erosion, saltwater intrusion, and a rising water table, all of which may adversely affect threatened and endangered species (Rowland, Cross, & Hartmann, 2014).

Corals in many tropical regions are affected by increasing water temperatures that cause mass bleaching and infectious disease outbreaks. Carbon dioxide absorbed into the ocean from the atmosphere reduces calcification rates in reef-building and reef-associated organisms by decreasing the pH in seawater (ocean acidification) (National Oceanic and Atmospheric Administration, 2015b).

Forest fires, insect outbreaks, and tree mortality caused by climate change are a serious problem in forests of the interior west, the southwest, and Alaska (U.S. Climate Change Science Program, 2008).

Climate change effects include warmer air and ocean temperatures, more high-intensity rainfall events, and more frequent heat waves. Warming temperatures also cause increases in ozone levels that can damage vegetation, adversely affecting the growth of plants and trees by reducing their ability to take up carbon dioxide from the atmosphere (Environmental Protection Agency, 2012).

The average length of the growing season in the contiguous 48 States has increased by nearly 2 weeks since the beginning of the 20th century. A particularly large and steady increase occurred over the last 30 years (Environmental Protection Agency, 2015b). The warmer and drier conditions caused by rising global temperatures and longer growing seasons favor species adapted to those conditions, threatening the success of species requiring cooler and wetter conditions (Washington Department of Fish and Wildlife, 2012).

## 3.3 Habitat Descriptions

A brief discussion of the potential for habitats typically associated with SFHAs that may be affected by floodplain development is provided below.

### 3.3.1 Wetland Habitats

Forested and nonforested wetlands may be affected by all four of the general effects of development. Habitat loss, degradation, and disturbance often occur when wetlands are filled to create developable land, dredged to create navigable waters, or diked off of supporting waterways for the purposes of flood control. The removal of trees from forested wetlands may alter habitat quality. Floodplain development may result in the degradation of movement corridors within forested and nonforested wetlands. Development in or near wetlands may also degrade water quality. Wetlands may be affected by changes in hydrology, erosion, and sedimentation. These

changes resulting from development, such as channelization and bank armoring, may scour away or deposit sediment, altering the extent and characteristics of wetland habitats. Irrigation associated with nearby development could affect groundwater, lowering the water table and reducing water available to wetland plants and trees (Environmental Protection Agency, 1993) (North Carolina State University, 1995).

Mammals, birds, reptiles, amphibians, fish, and invertebrates rely on forested and nonforested wetland habitats for foraging, breeding, and nesting; these animals would be affected by habitat loss or degradation from changes in hydrology or rises in the water table. Habitat fragmentation could also result in low genetic diversity due to isolation from restricted population sizes and changes in migration corridors (North Carolina State University, 1995).

When roads are constructed in wetland areas, vehicles are often a cause of mortality for small, slow-moving reptiles and amphibians, as well as some mammals. Changes to water quality may reduce the availability of suitable aquatic prey for mammals, birds, reptiles, amphibians, and fish and changes to hydrology and sediment transport could result in scour or sediment deposition, altering habitat characteristics for these sub-groups.

Amphibians of forested and nonforested wetlands typically rely on the presence of both aquatic and adjacent terrestrial habitats. Shallow pools and ponds are of particular importance to wetland amphibians as breeding grounds, and most of these amphibians spend their early life stages in these aquatic habitats. Therefore, habitat loss, water quality degradation, and changes in hydrology from development activities could prevent species from breeding and reduce population sizes. Habitat fragmentation could also degrade necessary corridors connecting ponds to wetland habitats (U.S. Fish and Wildlife Service, 2014f).

Vernal pool habitat supports endemic crustaceans, including fairy shrimp and tadpole shrimp. Approximately 95 percent of vernal pools have been filled due to urbanization and agricultural expansion, which continues to be the largest threat to this habitat. Urbanization affects vernal pools by altering the soil, water regime, water quality, and vegetation (U.S. Fish and Wildlife Service, 2005a), (U.S. Fish and Wildlife Service, 1998e).

### 3.3.2 Freshwater Habitats

Freshwaters (streams and canals, lakes, reservoirs, and estuaries) may be affected by all four of the general effects of development. Habitat loss, degradation, and disturbance often occur when fresh waters are filled to create developable land, dredged to create navigable waters, or impounded to create reservoirs. Development in or near fresh waters may also degrade water quality though the changes in hydrology, erosion, and sedimentation described above, including the alteration of water temperatures by removing shade from waterways. Changes to the processes of hydrology resulting from development may scour away or deposit sediment, altering the extent and characteristics of freshwater habitats. Such changes may include the channelization of waterways, bank armoring, or reductions in floodplain area (North Carolina State University, 1995). The removal of groundwater, which may occur as a result of irrigation associated with nearby development, may lower the water table and reduce water availability to these freshwater habitats.

All of the above effects may result in the degradation of movement corridors. In particular, impoundments of streams may prevent fish, amphibians, and aquatic invertebrates from reaching breeding grounds or other key habitat areas. The above effects may also reduce the availability and quality of freshwater foraging habitats for fish, birds, and mammals. Increased recreational activities in the vicinity of development, including off-road vehicles (ORV) and boat use, may disturb or degrade important freshwater habitat areas for mammals, birds, amphibians, fish, invertebrates, and plants.

Freshwater resident fish, anadromous fish, and manatees could all be affected by loss of movement corridors caused by habitat fragmentation. A change in water quality may reduce the availability of suitable prey, and a change in sediment loads may result in decreased underwater visibility and increased turbidity, altering preferred habitat characteristics for these species. Commercial and recreational freshwater activities could lead to an increase in habitat disturbance, entanglement with fishing gear or human trash, and collisions with vessels (U.S. Fish and Wildlife Service, 1994c), (U.S. Fish and Wildlife Service, 2001c).

Habitat degradation and fragmentation could affect freshwater amphibians due to decreased availability of suitable habitat and a loss of spring and stream flow. Changes in water quality may reduce the availability of suitable prey and nesting areas and a change in sediment loads may increase turbidity and decrease water oxygenation, altering preferred habitat characteristics for these species (U.S. Fish and Wildlife Service, 1996a).

Sessile and slow-moving freshwater invertebrates, such as mussels and snails, are especially sensitive to sedimentation and stream channel changes. For example, sedimentation may bury viable mussel beds. Fragmentation of mussel and snail populations due to channelization may result in reduced reproductive viability for the species (U.S. Fish and Wildlife Service, 1984g), (U.S. Fish and Wildlife Service, 1993d).

### 3.3.3 Nearshore Marine Waters

Development within floodplains does not generally result in fragmentation, degradation, or loss of marine habitat or movement corridors for nearshore marine mammals, birds, fish, invertebrates, and plants. However, nearshore marine waters and the species dependent upon the habitat they provide may be indirectly affected by changes to water quality associated with development in floodplains. These effects may include habitat degradation resulting from the movement of debris into nearshore marine waters associated with rainfall events or following floods or other natural disasters. Similarly, the construction of breakwaters, dikes, and other structures installed to protect beaches and other nearshore areas may alter the processes of hydrology, erosion, and sedimentation in nearshore marine waters, which could alter habitat characteristics (Environmental Protection Agency, 1993).

Effects to nearshore marine waters could affect mammals, birds, fish, invertebrates, and plants due to changes in sediment transport, water quality, and hydrology. Increased boat traffic associated with development may disturb habitats for these species sub-groups and boat strikes could cause injury or mortality. Movement corridors within offshore marine waters would not be affected by development in SFHAs.

Habitat degradation in the nearshore marine environment may reduce the availability of suitable prey and forage, impair water quality, and alter the preferred habitat composition for mammals, birds, fish, invertebrates, and plants. Commercial and recreational marine activities could lead to an increase in open ocean habitat disturbance and collisions with marine vessels, and cause entanglement with fishing gear or human trash (National Marine Fisheries Service, 2007a), (U.S. Fish and Wildlife Service, 2013e).

### 3.3.4 Beaches

Development along coastal beaches, such as the construction of roads and commercial or residential areas, could cause loss and fragmentation of beach habitat, impairing migration, or the ability to reach other necessary habitats or breed with other populations. Development on or near beaches could also cause changes to water quality, hydrology, and sediment transport. An increase in runoff or erosion could carry sand away from beaches, causing additional habitat loss.

Beach mammals typically rely on sandy coastal areas for nesting and foraging. These mammals generally reside in burrows dug in the sand. Development along beaches could lead to the degradation or destruction of these burrows as well as the loss of important food sources, including seeds, grasses, and small animals. The construction of roads and commercial or residential developments near beaches often cause mortalities from vehicle collisions and increased occurrence of predation and disease from domestic and feral cats, dogs, and pigs (U.S. Fish and Wildlife Service, 1987a).

Nearshore marine mammals and birds rely on beaches for mating, nesting, and resting, and sometimes for foraging (when in bays or estuaries). On-shore habitat degradation and fragmentation could result in the loss of preferred nesting habitats.

Although sea turtles are associated most closely with offshore marine waters, they rely on coastal beaches for nesting. Habitat loss and fragmentation could result in the loss of preferred nesting habitats and the disorientation of migrating or nesting sea turtles. A decrease in water quality may reduce the availability of suitable prey and forage and alter the preferred habitat composition for these species.

Development along beaches may disturb or alter nesting sites for mammals, birds, reptiles, and invertebrates, possibly reducing reproductive success for these species. Disturbances associated with beach development include the installation of lights, recreational use of beaches by people, the presence of domestic animals, and ORV use.

The installation of sea walls, dikes, or other erosion control structures may also alter beach habitats for mammals, birds, reptiles, invertebrates, and plants (National Marine Fisheries Service, Office of Protected Resources, and U.S. Fish and Wildlife Service, Southeast Region, 2013).

### 3.3.5 Barren Lands

In barren lands, development such as road construction or construction in commercial or residential areas could cause loss and fragmentation of habitats or removal of migration corridors. Development activity could disturb or damage existing habitat and vegetation, which may reduce availability of suitable prey or food sources. As defined in this document, barren lands typically lack water bodies; therefore, development in barren lands is not likely to affect hydrology or water quality.

Barren land mammals require open terrain for good visibility to avoid predators. Some of these mammals, particularly bighorn sheep, also require flat migration corridors for access to other mountain ranges, and therefore other sources of food and breeding gene pools (U.S. Fish and Wildlife Service, Region 1, 2000). Development could result in a degradation of habitat quality by adding structures and vegetation that fragment the open terrain and reduce visibility and interrupt or remove migration corridors.

Barren land reptiles tend to burrow in uncompacted and undisturbed sandy areas or hide under vegetation for protection (U.S. Fish and Wildlife Service, 1984a). Ground disturbance from development in these sandy barren land areas could compact the soil and damage vegetation, degrading habitat quality for these species.

Barren land invertebrates often spend most of their time in rock cracks and fissures or in the shaded areas between boulders (U.S. Fish and Wildlife Service, 1984h). Some require vegetation as a food source, with some species relying on one specific plant for food (Lockwood & Lockwood, 2008). Development could damage or remove vegetation and rock habitats, reducing overall habitat quality for these species.

### 3.3.6 Caves

Because construction of roads and development of commercial or residential areas does not occur within caves, effects on habitats from development are not expected. However, development that occurs in areas nearby or adjacent to caves could result in adverse impacts to the water quality in caves. Caves may contain standing or flowing water depending on local aquifers and the hydrologic processes of the area. Construction activities could lead to soil erosion and sedimentation that can degrade the water quality of nearby groundwater sources. Non-point source runoff of contaminants from roadways, parking lots, and lawns, and point-source contaminants from nearby industrial activities could also degrade the water quality of groundwater sources that feed into caves.

Cave-dwelling amphibian, fish, and invertebrate species require good water quality, particularly cave amphibians that require groundwater with constant conditions (i.e., temperature, pH, and flow). Nearby construction activities could lead to erosion, sedimentation, or polluted runoff that could degrade the habitat, water quality, and quality/availability of food sources for these species (U.S. Fish and Wildlife Service, 2008c) (U.S. Fish and Wildlife Service, 2013i) (U.S. Fish and Wildlife Service, 2015d).

### 3.3.7 Rangelands

Ground disturbance from construction may lead to the destruction of the low-growing vegetation characteristic of rangelands, resulting in a reduced suitable prey or food base for many species.

Rangeland mammals, birds, reptiles, invertebrates, and plants may be affected by the habitat quality degradation of these development effects. Small rangeland mammals and some reptiles typically spend a large amount of their time in burrows, some of which have complex underground structures. Development in rangelands could lead to the degradation or destruction of these burrows and a reduction in important food sources, including seeds and grasses (U.S. Fish and Wildlife Service, 1990b) (U.S. Fish and Wildlife Service, 2014n).

Several rangeland mammals, such as bison and pocket gophers, rely on large contiguous areas of habitat. Development could fragment habitat and degrade or remove important movement corridors for these species, isolating populations and increasing their risk of extinction (U.S. Fish and Wildlife Service, 2011e) (U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office, 2014).

Many rangeland birds and reptiles rely on low-growing vegetation for protection from predators. The ground disturbance related to development could reduce this vegetation cover, degrading habitat quality for these species (U.S. Fish and Wildlife Service, 1990b) (U.S. Fish and Wildlife Service, 2014h). Snakes, tortoises, and geckos require plenty of sunlight to maintain body temperatures (U.S. Fish and Wildlife Service, 1986a). Some rangeland invertebrates rely on host plants that may only grow in open environments with plenty of sunshine (U.S. Fish and Wildlife Service, 2003a). Development could alter the rangeland landscape, adding structures and vegetation, particularly trees that could provide too much shade for these species.

### 3.3.8 Forest Lands

Habitat loss, fragmentation, degradation, and disturbance may occur when forested land is converted to developed areas. Deforestation destroys important elements of this habitat type, including mature trees, and degrades movement corridors. The ground disturbance of construction also impacts the forest undergrowth. The alteration of the existing habitat could also result in a loss of suitable prey or food sources for many species.

Small mammals and birds rely on the mature trees, dead standing or downed snags, and tree cavities in forests for cover, foraging, and nesting. The removal or disturbance of trees from

development could remove habitat for these species, and negatively affect important food sources from the removal of other forest land plants. Some mammals, including large predators, require large areas of contiguous forest habitat. Development could fragment habitat and degrade or remove important movement corridors for these species, thereby increasing their risk of extinction from the isolation of populations and gene pools (U.S. Fish and Wildlife Service, 2005c) (U.S. Fish and Wildlife Service, 2011d).

Forest reptiles, amphibians, and invertebrates rely on the significant amounts of canopy cover, damp leaf litter, and undergrowth of forest lands for foraging and nesting. Amphibians, in particular, rely on the canopy cover of forests to promote a shaded, moist ground, which is vital for maintaining a moist skin surface for hydration and respiration. Development could degrade the habitat by reducing the amount of canopy cover available for these species and removing necessary host plants in the forest undergrowth (U.S. Fish and Wildlife Service, 1984f) (U.S. Fish and Wildlife Service, 1994b) (U.S. Fish and Wildlife Service, Southeast Region, 2014).

The conversion of forest land to roads and commercial or residential developments often causes mortalities from vehicle collisions and increased occurrence of predation and disease from domestic and feral cats, dogs, and pigs (U.S. Fish and Wildlife Service, 1992a) (U.S. Fish and Wildlife Service, Pacific Island, 2009).

### 3.3.9 Perennial Snow or Ice

It is not likely that development and associated adverse impacts would occur in areas that are covered by snow or ice year-round.

## 3.4 Regulatory Programs that Interact with the NFIP

Several Federal regulatory programs interact with the NFIP. Each of these programs regulates activities in and near floodplains in important but different ways. Due to their potential impact on water quality, projects that have to address NFIP floodplain management requirements typically also require Section 404, Section 401, and National Pollutant Discharge Elimination System (NPDES) permits to ensure adequate protection of the physical and biological integrity of the nation's waterways. The vast quantity of regulation at the Federal, State, and local level, as defined within this section, combine to influence the regulatory environment for floodplain development and present a challenge in attributing specific responsibility for floodplain development, and its associated effects, to any one party.

### 3.4.1 Endangered Species Act

Signed into law in 1973, the Endangered Species Act (ESA) protects imperiled species and the ecosystems upon which they depend. USFWS administers the ESA for terrestrial and freshwater organisms, while NMFS administers the Act primarily for marine wildlife and anadromous fish. Under the Act, an endangered species is defined as a species currently in danger of becoming extinct, while a threatened species is likely to become endangered in the foreseeable future.

Section 7(a)(2) of the ESA requires all Federal agencies to consult with the Services to ensure that any action they fund, authorize, or carry out does not jeopardize the continued survival of any endangered or threatened species or adversely modify designated critical habitat. Section 7(a)(2) generally requires a Federal agency to conduct a biological assessment to identify any endangered or threatened species that may be affected by the agency's action. There are three possible results of such an assessment: (a) a determination is that a project with have "no effect", positive or negative, on ESA-listed species and designated critical habitat; (b) a determination that the action "may affect, but is not likely to adversely affect" the species; and (c) a determination that the action "may affect, and is likely to adversely affect" the species. If the agency makes a

determination that the Proposed Action has "no effect," then concurrence from the Services is not necessary and no further action is warranted. If the agency makes a determination that the Proposed Action "may affect, but is not likely to adversely affect ESA-listed species and designated critical habitat, then coordination with the Services is required. If the Services concur with an agency's finding that an action "may affect but is not likely to adversely affect" the species, then the consultation is complete. However, if the Services do not concur with such a finding, then consultation continues. The Services then use the agency's biological assessment as the basis for developing a Biological Opinion that further analyzes the action's impact on species to determine if the Proposed Action would jeopardize ESA-listed species or adversely modify designated critical habitat. If jeopardy or adverse modification of designated critical habitat is found by the Services, the Services will suggest a "reasonable and prudent alternative" (RPA) to the Proposed Action that will allow the Federal agency to proceed without jeopardizing the continued survival of ESA-listed species (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 1998).

However, even if an RPA may be implemented to avoid jeopardy or adverse modification, it may still result in the take of ESA-listed species. Section 9 of the ESA prohibits the taking of ESA species. Take is defined as harassing, harming, pursuing, hunting, shooting, wounding, killing, trapping, capture, or collection of ESA species, or attempting to engage in any such conduct. Harm includes significant habitat modification or degradation that results in death or injury to ESA species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to ESA species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 C.F.R. §17.3). If take will occur from the implementation of an RPA, the Services will develop an incidental take statement to exempt such take from the prohibitions of Section 9 of the ESA.

Section 10 of the ESA provides exceptions to the Section 9 prohibitions. The exceptions most relevant to Section 7 consultations are takings allowed by two kinds of permits issued by the Services: (1) scientific take permits and (2) incidental take permits. The Services can issue permits to take listed species for scientific purposes or to enhance the propagation or survival of listed species. The Services can also issue permits to take listed species incidental to otherwise legal activity.

The take prohibitions of Section 9 of the ESA also apply to non-Federal parties. Section 10(a)(1)(B) of the Act allows non-Federal parties to apply for an incidental take permit for activities that could result in the incidental taking of ESA-listed species. The application must include a habitat conservation plan (HCP) that lays out the Proposed Actions, determines the effects of those actions on ESA species and their habitats, and defines measures to minimize and mitigate adverse effects (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 1998).

As stated above, private floodplain development is not FEMA's action, in that FEMA does not authorize, fund, or carry out private floodplain development (except pursuant to the grants programs, which are not within the scope of this evaluation). Because private floodplain development is not FEMA's action, and because FEMA has no authority to prohibit such development or control the rate or quantity of such development, Section 7 would be inapplicable to these actions. As such, FEMA utilizes Sections 9 and 10 of the ESA as the authority for requiring participating communities to ensure that project proponents have assessed, and appropriately addressed, any adverse effects of development in the SFHA on ESA-listed species and designated critical habitat, thereby ensuring there is no "take" in violation of Section 9 of the ESA.

### 3.4.2 Executive Order 11988/13690, Floodplain Management

Issued in 1977, Executive Order 11988, Floodplain Management, requires all Federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

The Executive Order affects actions including the acquisition, management, and disposal of Federal facilities and land; federally undertaken, financed, or assisted construction and improvements; and Federal programs and activities affecting land use (42 F.R. 26951). Prior to any Federal action, the agency must determine whether the Proposed Action will occur in the floodplain; identify and evaluate practicable alternatives "to avoid adverse effects and incompatible development in the floodplains;" identify the impacts of the Proposed Action; develop measures to minimize potential harm to people, property, and floodplains; and provide an opportunity for public review and comment. EO11988 reviews are generally conducted as part of environmental review under the National Environmental Policy Act (NEPA). However, they still must be undertaken in situations where no NEPA review is required.

Issued in 2015, EO 13690 amends EO 11988 and establishes the new Federal flood risk management standard, which is a flexible framework to increase resilience against flooding and help preserve the natural values of floodplains. Incorporating this standard will ensure that agencies expand management from the current base flood to a higher vertical elevation and corresponding horizontal floodplain to reduce the impacts of flooding and ensure that projects funded with taxpayer dollars last as long as intended. Neither executive order is intended to prohibit development in the floodplain, but instead requires executive departments and agencies to address current and future flood risks when funding projects. Additionally, neither executive order impacts the development in the floodplain by local communities where no Federal funding, authorization, management, or construction is involved.

### 3.4.3 Executive Order 11990, Protection of Wetlands

Executive Order (EO) 11990 "Protection of Wetlands" requires Federal agencies to minimize the destruction, loss, or degradation of wetlands, including waters of the United States, and to preserve and enhance the natural and beneficial values of wetlands. Before implementing an action that is located in, or may affect, a wetland, this EO requires Federal agencies to demonstrate that there is no practical alternative and the Proposed Action includes all practical measures to minimize harm to the wetlands. The Federal agency must also provide opportunity for early public review by those who may be affected and include its findings in its environmental or other appropriate decision documents. Projects requiring compliance with this EO are likely to require a permit under Section 404 of the Clean Water Act. The USACE has permitting authority over activities affecting waters of the United States. Waters of the United States include surface waters such as navigable waters and their tributaries, all interstate waters and their tributaries, natural lakes, all wetlands adjacent to other waters, and all impoundments of these waters. Accordingly, Federal regulation of wetlands is under the jurisdiction of the USACE (although the USACE has delegated permitting authority to some States). See http://www.spk.usace.army.mil/Missions/Regulatory/Jurisdiction.aspx.

### 3.4.4 Section 404 and 401 of the Clean Water Act

The Clean Water Act (CWA), passed in 1972, establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Through a variety of regulatory and non-regulatory initiatives, the CWA is designed to restore and maintain the chemical, physical, and biological integrity of the nation's

waters, including wetlands. Sections 404 and 401 most directly influence development and related activities within floodplains.

Section 404 of CWA establishes a program to regulate the discharge of dredged or fill material into waters of the United States, including wetlands. "Fill material" includes not only soil or dredge material, but also bridge footings, pier pilings, and other man-made materials. A Section 404 permit must be obtained from the USACE for any activity that includes the discharge of dredged or fill material into waters of the United States, including wetlands. Section 404 permits are either individual or general. Individual permits are required for specific activities that may potentially create significant impacts, such as the construction of dams, levees, and highways along a waterway. General permits may be granted by the USACE on a nationwide, statewide, or regional basis for activities that produce minimally adverse effects, such as minor culvert or road crossings over streams. Thus, the USACE has a direct authority to regulate waters of the United States, including wetlands, and Section 404 permitting is one regulatory mechanism that affects development within riverine and coastal floodplains.

The U.S. Environmental Protection Agency (EPA) plays a key oversight role in the implementation of Section 404 through the Section 401 water quality certification process, which is required for issuance of a Section 404 permit. In some States, Section 401 authority is delegated to a State regulatory agency. The main function of Section 401 is to allow State and Tribal jurisdictions to review and approve, condition, or deny all Federal permits or licenses that may produce discharge within the jurisdiction's waterway. Applicants for a Federal license or permit must demonstrate that either the State in which the proposed discharge will originate or the interstate water pollution control agency with jurisdiction over the navigable waters in question has approved the proposed development. As a result, all Federal permits, including those issued by USACE, must also meet all applicable State (or interstate) water management provisions. Throughout the Section 404/401 process, the USFWS, NOAA Fisheries, and State resource agencies all play an advisory role for USACE and EPA.

In most cases, the jurisdictional limit of Section 404 and Section 401 permitting is the highest tide line in tidal areas and the ordinary high water mark along freshwater waterways. Wetlands and relatively permanent tributaries with connection to navigable waters are also generally under Section 404 and Section 401 jurisdiction. While floodways typically fall entirely within the jurisdictional limit of Section 404 and 401 permitting, the full extent of the SFHA may not.

In addition to these aspects of the CWA, the National Pollutant Discharge Elimination System (NPDES) Stormwater Program is a comprehensive, two-phased national program for addressing the non-agricultural sources of stormwater discharges that adversely affect the quality of the nation's waters. The program uses the NPDES permitting mechanism to require the implementation of controls designed to prevent harmful pollutants from being washed into local water bodies by stormwater runoff. The NPDES permit requirements include mandatory permits for any earth moving or ground clearing for areas larger than 1 acre. Implementation of this phase of the program will provide a higher degree of agency review and corresponding measures to protect aquatic resources.

### 3.4.5 Sections 9 and 10 of the Rivers and Harbors Act

Sections 9 and 10 of the Rivers and Harbors Act represent additional Federal legislation that influences the type and intensity of development around navigable waters. Originally passed in 1899, Section 9 of the Act prohibits bridges, dams, dikes, or causeways to be constructed over or within U.S. navigable waters without Congressional approval (33 U.S.C. § 403, Chapter 425). Both the U.S. Coast Guard and the USACE have jurisdictional authority in the administration of Section 9. State legislatures may authorize the construction of such structures if the affected

navigable waters are contained wholly within the State. Section 10 requires approval from the USACE for the construction of wharfs, piers, jetties, or other structures. Projects occurring in the floodplain that have to address NFIP floodplain management requirements must also take the provisions of this Act into account for development near navigable waters.

### 3.4.6 Coastal Barrier Resources Act and Coastal Barrier Improvement Act

The Coastal Barrier Resources Act (CBRA) (Public Law [P. Law] 97–348, 16 U.S.C. §§3501–3510, 42 U.S.C. §4028), administered by the USFWS, was enacted to protect sensitive and vulnerable barrier islands found along the U.S. Atlantic, Gulf, and Great Lakes coastlines. The CBRA established the Coastal Barrier Resources System (CBRS), which is composed of undeveloped coastal barrier islands, including those in the Great Lakes. The areas protected under CBRA include CBRS protected system units and Otherwise Protected Areas. Areas contained within the system are ineligible for direct or indirect Federal funds that might support or promote coastal development. The CBRS areas are located in nearly 400 communities on the Atlantic and Gulf coasts and along the Great Lakes shores, and cover an estimated 3 million acres. These areas are delineated on the communities' flood maps.

The CBRS currently includes 585 System units, encompassing approximately 1.3 million acres of land and associated aquatic habitat. CBRS system units are usually relatively undeveloped private lands at the time of designation within the CBRS. Most new Federal expenditures and financial assistance, including Federal flood insurance, are prohibited within System units.

Otherwise Protected Areas (OPA) are generally comprised of lands held by a qualified organization primarily for wildlife refuge, sanctuary, recreational, or natural resource conservation purpose. The CBRS currently includes 272 OPAs, encompassing approximately 1.9 million acres of land and associated aquatic habitat. The only Federal spending prohibition within OPAs is the prohibition on Federal flood insurance. (U.S. Fish and Wildlife Service, 2015)

### 3.4.7 Coastal Zone Management Act

The Federal Coastal Zone Management Act of 1972 calls for the "effective management, beneficial use, protection, and development" of the nation's coastal zone and promotes active State involvement in achieving these goals. The Act requires participating coastal States to develop coastal zone management programs to effectively manage coastal zones within State boundaries. These programs are intended to protect wetlands, floodplains, estuaries, beaches, dunes, barrier islands, and fish and wildlife habitat and often involve coordinating permit processes, landowner assistance, and grants to communities. Upon Federal approval of a State's coastal zone management program, the State becomes eligible for Federal coastal zone grants. Grant allocation is based on the total number of shoreline miles and shoreline population density within the State. Development projects within the coastal zone must demonstrate compatibility with the State's coastal zone program and apply for a coastal zone permit; review by other regulatory agencies such as USFWS and NOAA Fisheries is typically part of a coastal zone permit review. For projects in the coastal zone that are funded, authorized, or carried out by a Federal agency, a Federal consistency determination is submitted to the State as confirmation the project is consistent with the State coastal zone program.

### 3.4.8 National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 requires Federal agencies to assess the environmental impacts of their Proposed Actions and reasonable alternatives to those actions. Potential project impacts to physical, air and noise, socioeconomic, biological (including ESA species), transportation, land use, aesthetics, environmental justice, and cultural resources are analyzed.

Projects in the floodplain that are federally funded, such as hazard mitigation grants, are required to document compliance with NEPA. The NEPA document would also include an assessment of a project's potential to affect ESA-listed species and designated critical habitats. The level of NEPA analysis depends on the anticipated impacts of the project. For projects with minimal to no impacts, a Categorical Exclusion (CATEX) may be prepared. A CATEX is a list of actions an agency has determined do not individually or cumulatively affect the quality of the human environment (40 C.F.R. §1508.4).

If the Proposed Action is not included in the list of categorically excluded actions, an Environmental Assessment (EA) must be prepared. EAs are concise public documents that include the need for a proposal, a list of alternatives, and a list of agencies and persons consulted in the proposal's drafting. The purpose of an EA is to determine the significance of the proposal's environmental outcomes and to look at alternatives of achieving the agency's objectives. An EA is supposed to provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement (EIS), aid an agency's compliance with NEPA when an EIS is not required, and facilitates preparation of an EIS when one is necessary. If no substantial effects on the environment are found after investigation and the drafting of an EA, the agency must produce a Finding of No Significant Impact (FONSI). This document explains why an action will not have a significant effect on the human environment and includes the EA or a summary of the EA that supports the FONSI determination.

If it is determined that a proposed Federal action does not fall within a designated CATEX or does not qualify for a FONSI, then the responsible agency must prepare an EIS. The purpose of an EIS is to help public officials make informed decisions based on the relevant environmental consequences and the alternatives available. The drafting of an EIS includes public party, outside party, and other Federal agency input concerning its preparation.

An EIS is required to describe the environmental impacts of the Proposed Action, any adverse environmental impacts that cannot be avoided should the action be implemented, the reasonable alternatives to the Proposed Action, the relationship between local short term uses of man's environment along with the maintenance and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources that would be involved in the Proposed Action.

### 3.4.9 Magnuson-Stevens Fishery and Conservation Act

Under the Magnuson-Stevens Fishery Conservation and Management Act (MSA; P. Law 94-265) (National Marine Fisheries Service, 2007b), as amended by the Sustainable Fisheries Act of 1996 (P. Law 104-267), Congress mandated the identification of habitats essential to managed species and measures to conserve and enhance these habitats. Essential Fish Habitat (EFH) is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity… 'Waters' includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle" (National Marine Fisheries Service, 2004). The MSA requires cooperation among NOAA Fisheries, the eight regional Fishery Management Councils (FMCs), and Federal and State agencies to protect, conserve, and enhance EFH.

Pursuant to Section 303(a)(7) of the MSA (National Marine Fisheries Service, 2007b), regional FMCs must prepare Fishery Management Plans (FMPs) which include the identification of EFH used by all life history stages of each managed species. NOAA Fisheries and the FMCs, under

the authority of the Secretary of Commerce, are mandated to describe and identify EFH in each FMP; minimize to the extent practicable the adverse effects of commercial fishing on EFH; and identify other actions to encourage the conservation and enhancement of EFH (50 C.F.R. § 600.805-930). NOAA Fisheries and the regional FMCs also identify Habitat Areas of Particular Concern (HAPC) (National Marine Fisheries Service, 2015b).

Section 305(b)(2) of the MSA requires a Federal agency to consult with NOAA Fisheries on all activities, or proposed activities, authorized, funded, or undertaken that might adversely affect EFH. As part of the EFH consultation process, Federal agencies must prepare a written EFH Assessment describing the effects of that action on EFH. NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes such as NEPA, Section 7 of the ESA, or the Fish and Wildlife Coordination Act. NOAA Fisheries must provide the Federal agency with EFH consultation recommendations for any action that may adversely affect EFH (50 C.F.R. § 600.805-930).

### 3.4.10 State and Local Floodplain Management Regulations

State and local agencies often establish floodplain regulations to address floodplain issues and flooding concerns. Because these regulations are specific to each State or community, they may vary widely. State floodplain programs are usually administered by a State's environmental protection or natural resources department or through the emergency management department, which may institute supplemental or independent reviews, permitting, or floodplain management requirements for projects that occur in floodplains. Local floodplain regulatory programs are generally implemented by county or community hazard prevention departments, zoning departments, environmental departments, or conservation districts. These local agencies may institute supplemental or independent environmental review, permitting, or floodplain management requirements for projects that occur in floodplains.

## 3.5 Major Factors Influencing Floodplain Development

The NFIP is sometimes perceived, based on anecdotal evidence, as encouraging development in the floodplain. However, the studies and analysis in this section demonstrate that development in the nation's floodplains is driven by other factors. This section provides an overview of the primary factors influencing development, such as economic factors, including the availability of jobs, proximity to ports, and tourism and recreation; infrastructure; and proximity to natural resources and existing communities.

Historically, people have been attracted to water as places for living, industry, commerce, and recreation. During the early settlement of the United States, locations near water provided necessary access to transportation and a water supply. Many of the oldest and largest cities in the United States are located near the Atlantic or Pacific Oceans, or on harbors that join the ocean (New York, New Orleans, Boston, Baltimore, San Francisco, etc.). As populations grew and cities began to expand, these locations were very important for trading and shipping, with communities growing in the surrounding areas (job creation). Settlements near water also have fertile soils, making them prime agricultural lands.

This pattern of development continued as communities grew; even after natural disasters destroyed communities, damaged crops, and caused deaths, communities continually chose to rebuild in the floodplain. In April and May 1927, the most destructive historical flood in the United States occurred along the Mississippi River resulting in 500 deaths and leaving 600,000 people without homes. Across Illinois, Missouri, Kentucky, Tennessee, Arkansas, Mississippi and Louisiana, some 16 million acres of land (26,000 square miles) were inundated with water (Webley, 2011). After the floods of 1927, the USACE used Federal funds from the Flood Control

Act of 1928 to develop a flood-control system for the Mississippi River, allowing for the areas impacted to be rebuilt (Ashley County Ledger, Undated). In 1861-1862, a "megaflood" occurred in Central Valley, California causing the State to go bankrupt (Ingram, 2012). Today, the same regions that were so greatly damaged in this flooding event, such as the Sacramento area (which also experienced floods in 1849, 1850, 1851, and twice in 1852 and 1853), are some of California's most prosperous and growing cities (Ingram, 2012) (New York Times, 1862). In recent decades, development along waterways and shorelines — areas within floodplains — has been spurred by the aesthetic and recreational value of these locations (American Institutes for Research - Blais et al., 2006) (Comptroller of the United States, 1982).

Numerous factors influence individuals and communities to develop in the floodplain. The key factors identified in the studies reviewed by the Government Accountability Office (GAO) as driving development in the floodplain were the diverse natural resources, abundant wild life, agricultural lands, commercial and sport fishing resources, and diverse recreational potential. Additional factors identified by GAO include bridge access to barrier islands; community infrastructure such as roads, water, sewers, and utilities; the availability of mortgage and investment capital; construction costs; the state of the economy; and regional and local economic conditions (Comptroller of the United States, 1982).

**Table 3-2. New Privately Owned Housing Units Authorized**

| Year | Total Number of Authorizations for One Unit Structures | In SFHA |
|---|---|---|
| 2012 | 518,695 | 38,208 |
| 2013 | 620,802 | 45,591 |
| 2014 | 640,318 | 46,858 |
| 2015 | 695,998 | 50,750 |

Notes: A housing unit, as defined for purposes of these data, is a house, an apartment, a group of rooms, or a single room intended for occupancy as separate living quarters. Separate living quarters are those in which the occupants live separately from any other individuals in the building and which have a direct access from the outside of the building or through a common hall.

Source: (U.S. Census Bureau, 2016)

### 3.5.1 Economic Factors

**Jobs.** Jobs are one of the strongest development drivers in U.S. coastal areas (National Ocean Economics Program, 2014). The United States has 673 coastal watershed counties: 285 along the Atlantic Ocean (21.4 percent of all U.S. counties as of July 2013) (U.S. Census Bureau, 2013); 142 in the Gulf of Mexico region; 87 bordering the Pacific Ocean; and 159 fronting the Great Lakes (U.S. Commission on Ocean Policy, 2004). Coastal watershed counties[14] account for less than 25 percent of U.S. land area, yet they are home to more than 52 percent of the U.S. population a disproportionate number of people are driven to coastal areas due to jobs and other economic factors (U.S. Commission on Ocean Policy, 2004).

The U.S. ocean economy includes six sectors of economic activity that derives all or part of their inputs from the Atlantic Ocean, Pacific Ocean, or Great Lakes. These economic activities are significant drivers of coastal development and include: (1) construction, (2) living resources (e.g., fishing), (3) offshore minerals, (4) ship and boat building, (5) tourism and recreation, and (6) transportation. Of the 6 ocean economy sectors, tourism and recreation alone provided nearly 70 percent of jobs in 2012 (Table 3-3). In terms of economic GDP contribution, tourism and recreation contributed $89.25B, offshore minerals contributed $87.37B and transportation contributed $58.73B (Table 3-3). The concept of the ocean economy derives from the fact that the oceans and Great Lakes generate a large amount of economic activity (National Ocean Economics Program, 2014).

In 2000, coastal watershed counties were home to nearly half of the nation's jobs and generated a similar proportion of the nation's gross domestic product (GDP); more than $4.5T of the nation's annual GDP (as of 2000) is generated within coastal watershed counties (U.S. Commission on Ocean Policy, 2004). The contribution to employment is equally impressive with 60 million jobs in coastal watershed counties, more than 13 million of these jobs support trade transported by the network of inland waterways and ports that support our nation's waterborne commerce (National Oceanic and Atmospheric Administration, Undated). In addition, the cruise industry provided over 340,000 jobs paying over $16.5B in total wages and salaries in 2011 (American Association of Port Authorities, 2012).

Shore-adjacent counties are immediately adjacent to the shoreline of an ocean, the Gulf of Mexico, or a Great Lake. Watershed counties encompass coastal watersheds as defined by the U.S. Geological Survey, whereas inland counties are located outside of the defined coastal watershed areas. Within coastal States, the shore-adjacent counties comprise 37 percent of overall employment on only 17.5 percent of U.S. land area, indicating that the concentration of the nation's economy is found near the oceans and Great Lakes. The coastal economy sector consists of all economic activities in the coastal region (e.g., restaurants, hotels, surf shops, etc.) (National Ocean Economics Program, 2014).

In a study of all 30 coastal States in terms of employment and percentage of coastal land, 12 States in particular were found to be the most valuable in terms of their overall contribution to coastal employment (Table 3-3). Leading the top coastal States is California where shore-adjacent counties comprise 77.6 percent of land yet were responsible for providing 90 percent of overall employment in 2012 (National Ocean Economics Program, 2014).

[14] Coastal watershed counties are those counties with at least 15% of their land area in a coastal watershed.

**Table 3-3: Coastal State and Shore-adjacent County Employment, 2012**

| State | Total Private State Employment* | Coastal Employment | % of Shore-adjacent counties within State | % of State Jobs in Coastal Lands |
|---|---|---|---|---|
| California | 12,952,818 | 11,607,875 | 77.6% | 90.0% |
| Connecticut | 1,463,732 | 951,307 | 58.4% | 64.9% |
| Florida | 6,932,382 | 5,368,259 | 73.1% | 77.4% |
| Illinois | 5,119,826 | 2,727,015 | 48.4% | 53.3% |
| Louisiana | 1,644,282 | 685,462 | 36.6% | 41.7% |
| Maine | 486,838 | 322,929 | 55.4% | 66.3% |
| Maryland | 2,152,458 | 1,277,015 | 50.8% | 59.3% |
| Massachusetts | 3,035,897 | 1,712,214 | 52.8% | 56.4% |
| Michigan | 3,468,089 | 1,731,046 | 44.0% | 49.9% |
| New Jersey | 3,440,470 | 2,519,037 | 66.8% | 73.2% |
| New York | 7,556,521 | 6,506,129 | 76.0% | 86.1% |
| Washington | 2,361,697 | 2,078,302 | 71.8% | 88.0% |

Source: (National Ocean Economics Program, 2014)
*Private non-farm employment (U.S. Census Bureau, 2014)

**Ports.** Throughout the early years of the United States' history, commerce drove development to both riverine and coastal ports. Development adjacent to many of the nation's largest riverine waterways — such as the Mississippi, Ohio, Missouri, and Illinois Rivers — and development within our largest coastal ports — such as New York, San Francisco, and Houston — pre-dates the existence of the NFIP by more than a century. The "boomtowns" of the 19th century, including New Orleans, St. Louis, and Cincinnati, grew substantially on waterborne commerce. Waterborne commerce was so important during the 19th century "boomtown" period that the nation began to build new waterways, such as the Erie Canal (Smithsonian National Museum of American History, Undated). The sustained importance of ports to the nation's economy is likely to continue to drive development in those coastal and riverine areas.

In 2007, 13M employees worked in port-related jobs generating nearly $650B in annual personal income and $212.4B in Federal, State, and local taxes (Martin Associates, 2007). Jobs that directly depend on ports are terminal workers, longshoremen, pilots, forwarders, brokers, steamship agents and lines, ship crews, warehousing and transloading employees, container repair and leasing companies, chandlers, surveyors, ship repair and marine construction businesses, barge operators, and local government (American Association of Port Authorities, 2013).

Today, as coastal and riverine ports continue to provide access to ocean-related commerce, they continue to drive floodplain development. Users of the waterway system each year include 70,000 port calls for commercial vessels, 110,000 fishing vessels, and 20 million recreational vessels (National Oceanic and Atmospheric Administration, Undated). Additionally, international trade through U.S. coastal and riverine ports supports 25-30 percent of GDP and 13M jobs, supporting the growth of U.S. manufacturing, agriculture, forestry, and nationwide export initiatives (American Road & Transportation Builders Association, 2015).

Annually, the nation's ports handle more than $700B in goods to include the cruise industry ($12B), commercial fishing industry ($28B), recreational saltwater fishing ($20B), and recreational

boating ($30B). Over the next two decades, overseas trade via U.S. ports, including the Great Lakes, is expected to double in volume. The expanding ferry and cruise line industries continue to provide economically valuable means of transportation for work and leisure (U.S. Commission on Ocean Policy, 2004). For every $1B in manufactured goods exported though U.S. seaports, 15,000 American jobs are created (American Association of Port Authorities, 2012). Marine transportation and ports also play a central role in national security as U.S. harbors and ports are major points of entry to our country. Local, State, and Federal government agencies all maintain a significant presence in coastal areas related to fields of port management and law enforcement (U.S. Commission on Ocean Policy, 2004).

In 2012, the top U.S. coastal ports contributed over $1T in total imports and exports (Table 3-2). Los Angeles, one of the nation's largest ports, contributed $283.5B in total revenue, consistent with previous coastal land and employment findings for the State (U.S. Commission on Ocean Policy, 2004) (National Ocean Economics Program, 2014). Los Angeles is responsible for contributing approximately $336B annually to the U.S. GDP (Conway, 2013).

Since 2001, the Gulf Coast has expanded its job base by 7 percent and is projected to grow another 18 percent in the coming decade. Gulf Coast cities, such as New Orleans and Corpus Christi, are expanding due to a growing concentration of energy jobs, which are five times the national average for that sector (Kotkin, 2013).

Coastal ports along the East Coast are also expanding in terms of job, population, and development growth. One of the largest coastal ports on the East Coast is the New York port, which includes New York City and New Jersey. New York is responsible for contributing approximately $218.3B annually to the U.S. GDP (National Ocean Economics Program, 2015). Charleston, another East Coast port, contributes approximately $63.6B annually to the U.S. GDP (National Ocean Economics Program, 2015). In 2013, the Port of Chicago supported an estimated 6,900 jobs and America's Central Port, located on the Illinois side of the Mississippi River, handled 80M tons of product (McMeekin, 2013). Growth in employment and the economic gain from coastal ports supports development opportunities for this industry.

**Tourism and Recreation.** Tourism and recreation constitute the fastest growing sector of the ocean economy extending virtually everywhere along the coasts of the continental United States, southeast Alaska, Hawaii, and island territories and commonwealths. People are attracted to coastal properties as full-time or vacation homes. This was the finding of a 1982 GAO Report, which found that a multitude of factors influence a builder to construct, an individual to occupy a structure, or an executive to locate in a coastal or barrier island community. The report concluded that the primary reason for this development is desirability of the location for retirement and recreation purposes. GAO further concluded that other factors promoting development include the availability of a community infrastructure, the availability of capital, and the viability of the local economy (Comptroller of the United States, 1982). These conclusions were supported by a more recent study issued by the American Institutes for Research (American Institutes for Research - Rosenbaum, W. and Boulware, G., 2006).

Across the country, more than 89 million people a year participate in marine-related recreation, such as swimming, scuba diving, surfing, motor boating, sailing, kayaking, and wildlife viewing (U.S. Commission on Ocean Policy, 2004). In 2006, U.S. households made nearly 110 million trips to the beach, each spending an average of $850 per trip (National Oceanic and Atmospheric Administration, Undated).

Burgeoning industries associated with tourism and recreation require development in coastal areas, such as hotels, resorts, restaurants, fishing and dive stores, marinas, and other retail businesses these industries are leading tourism to be one of the nation's largest and fastest-growing economic forces. In four South Florida coastal counties, recreational diving, fishing, and

ocean-watching activities generate $4.4B in local sales and almost $2B in local income annually. Visitors to the Florida Keys total more than 2.9 million people each year. During the summer of 2000, beach activities in Los Angeles and Orange counties in California stimulated an estimated $1B in spending. The Hawaiian Islands and many U.S. island territories are particularly dependent on tourism for their economic health. Hawaii attracts close to 7 million tourists each year (U.S. Commission on Ocean Policy, 2004). In 2011, over 10 million passengers boarded cruise ships (U.S. Department of Transportation, 2012). More Americans participate in recreational fishing than in both of golf and tennis combined (U.S. Commission on Ocean Policy, 2004). Taken together, these industries collectively serve as a strong driver of coastal floodplain development throughout the country.

**Agriculture.** The EPA reports that more than $450B in foods, fiber, and manufactured goods depend on clean, healthy watersheds (Environmental Protection Agency, 2013a). The main source of food for the population is agriculture, which encompasses livestock, fisheries, and forestry. As the population continues to increase, more food and livestock feed are needed. The closer farmers are to water sources, the cheaper the production of food and feed would be. As the population increases, so would the consumer demand for food to feed the growing population, and this, in turn, would drive more agricultural development in areas near or surrounding water (LENNTECH, 2014).

### 3.5.2 Infrastructure

Many factors can influence development within the floodplain, including the attractiveness and location of the site for developers and consumers. More intense demands for development in the floodplain comes with population growth and development. An increase in population growth can lead to an increase in residential units and commercial businesses within a community. Property located near favorable amenities, such as central business districts, shopping, schools, recreational areas, open space, and areas of employment, add value to the property and increase the demand to develop these parcels (Burby, et al., 1988). The placement of streets and utility lines also affects the property value, and therefore, influences where developers are willing to invest. In a 1982 report, GAO identified the availability of community infrastructure as a key factor promoting development (Comptroller of the United States, 1982).

**Transportation.** Highway interchanges are often prime locations for fast food restaurants and hotels, as well as other types of businesses. Easy access to main thoroughfares and highway interchanges increase the land value and can intensify development pressures in areas where it might not otherwise occur. For instance, the Lake Pontchartrain Causeway enabled rapid growth in St. Tammany Parish, which is situated near New Orleans, Louisiana (Bagstad, Stapleton, & D'Agostino, 2007). Maryland State officials claim that the Chesapeake Bay Bridge (completed in 1952) and the Chesapeake Bay Bridge-Tunnel (completed in 1964) allowed for improved access to Ocean City, Maryland for residents of the Washington, DC and Baltimore, Maryland metropolitan areas (both of which are 50+ miles away from Ocean City), as well as southern Virginia. These infrastructure projects increased demand for development in their respective communities (Ocean City Maryland Chamber of Commerce, 2015). Multiple interviews indicated that improved transportation options were a primary driver for development on this barrier island (Comptroller of the United States, 1982).

Case Example: Mullin v Skinner

In Mullin v. Skinner, 756 F. Supp. 904 (E.D. N.C. 1990), the court acknowledged the substantial effect that construction of highways has on development. This suit involved a challenge brought against the Federal Highway Administration and other defendants for violations of NEPA related to its decision to allow the construction of a high-rise, fixed-span bridge at the island of Sunset Beach, NC. Although the Environmental Assessment concluded that the bridge project would not cause a significant alteration in development patterns, the court found that "it is obvious that constructing a large interchange on a major interstate highway in an agricultural area where no connecting road currently exists will have a substantial impact on a number of environmental factors." The court further found that its conclusion is supported by a Department of Transportation's document—PPM 90-1, August 24, 1971, 2 ELR 46106, which governs preparation of impact statements for federal-aid highway projects. That document states: "The improved access and transportation afforded by a highway may generate other related actions that could reach major proportion and which would be difficult to rescind. An example would be a highway improvement which provides access to a nonaccessible area, acting as a catalyst for industrial, commercial, or residential development of the area." Id., Appendix E, Par. 2f, 2 ELR at 46110. The court held that the "growth-inducing effects of the [proposed bridge project] are its reason d'etre, and with growth will come growth's problems: increased population, increased traffic, increased pollution . . . ." See Mullin, 756 F.Supp. at 920.

**Utilities.** The presence/absence of municipal services such as gas, electricity, water supply, communications, sanitary sewer connectivity, and other utilities has a significant influence on the land values, and therefore, can be considered an influential driver of development. Areas that maintain existing utilities tend to experience additional development, more than areas where utilities have yet to be installed (Asabere & Harvey, 1985) (Burby, et al., 1988) (Scott, 1989). When vacant land lacks access to adequate utilities, the associated costs for development increase and the likelihood of development decreases (Asabere & Harvey, 1985) (Burby, et al., 1988). Acquiring access to adequate utilities can significantly increase investment costs associated with development, especially if the nearest utility service is far from the site (Burby, et al., 1988) (Scott, 1989). When a site lacks access to utilities, developers often consider the costs associated with the actual development versus the final value of the finished development (U.S. Department of Treasury, 2010). As long as the costs to bring utilities to the site do not exceed final profit potential, a developer may opt to pay for installation of utilities in order to develop a desirable piece of land.

### 3.5.3 Proximity to Natural Resources / Existing Communities

The 1982 GAO report noted that people desire to locate in coastal and barrier island communities because of the beaches and the recreational and retirement opportunities they provide. The study indicates that people are driven to coastal areas because they are "richly endowed with natural resources, abundant wildlife, agricultural lands, commercial and sport fishing resources, and diverse recreation potential." In addition, the report also cited the convenience of "shorefront hotels, condominiums, restaurants, and shops…" (Comptroller of the United States, 1982). None of the research studies GAO reviewed attributed development in coastal and barrier island communities to the existence of flood insurance, but some reported on the increased growth in these types of communities and the reasons for that growth. Likewise, the American Institutes for Research found that "available evidence suggests that many CBRS units have developed, often quite extensively, despite the absence of NFIP insurance" (American Institutes for Research - Rosenbaum, W. and Boulware, G., 2006).

The desire for beach living is further evidenced by the fact that communities often rebuild after devastating storms. For example, both Ocean City, Maryland and Bethany Beach, Delaware were rebuilt after a major storm hit the area in 1962—six years before the creation of the NFIP (Comptroller of the United States, 1982). More recently, communities along the New York and New Jersey coasts elected to rebuild after Superstorm Sandy (hit landfall in 2012) (Joyce, 2013). Erwann Michel-Kerjan, managing director of the Risk Management and Decision Processes Center at Wharton, emphasizes that in the absence of an immediate and lethal threat, such as

nuclear contamination, it is hard to deter people from wanting to rebuild their homes" (University of Pennsylvania (Wharton), 2013).

In short as the American Institutes for Research noted in its 2006 report:

> "[A]lthough the availability of flood insurance may affect a decision to build in a floodplain that is also the habitat of an endangered species, the insurance alone is unlikely to be the sole or primary factor that leads to a decision to build. Indeed, it may not be a factor at all."

This report further found that the linkage between flood insurance and floodplain development, to the extent it exists, is not easily separated from other competing explanations of such development (such as those primary drivers of development discussed above) (American Institutes for Research - Rosenbaum, W. and Boulware, G., 2006).

## 3.6 The NFIP and Floodplain Development

Some have claimed, based on anecdotal evidence, that the NFIP reduces the financial risk to property owners and communities from potential flood disasters through relatively low-cost property insurance. However, the research and empirical evidence on the issue demonstrates that the asserted linkage between the availability of flood insurance and resulting impacts on development or the environment is tenuous. As defined by the ESA, indirect effects are those effects that are caused by a Proposed Action and are later in time, but are still reasonably certain to occur (50 C.F.R. § 402.02) whereas direct effects are caused by a Proposed Action and occur at the same time. The NFIP does not cause development to occur, nor does it play a significant role in facilitating or encouraging floodplain development. As such, floodplain development is neither a direct, nor an indirect, effect of the implementation of the NFIP.

### 3.6.1 Availability of NFIP Flood Insurance

A history of the NFIP and the available data demonstrate that the availability of flood insurance has proved a very poor incentive to develop in the floodplain. Prior to 1973, there were only 95,000 policies. Because of the lack of interest in purchasing flood insurance, Congress passed the Flood Disaster Protection Act of 1973, which required the purchase of flood insurance as a condition of receiving federally-backed loans and Federal assistance in special flood hazard areas of participating communities. Even after 1973, flood insurance purchases were still low, so Congress passed the National Flood Insurance Reform Act of 1994, which required Federal agency lender regulators to develop regulations to direct their federally regulated lenders not to make, increase, extend, or renew any loan on applicable property unless flood insurance is purchased and maintained. The law also addressed the responsibility of regulated lending institutions and Government-Sponsored Enterprises (GSEs) (i.e., Fannie Mae and Freddie Mac) in providing a notice of, and requiring, flood insurance coverage for the term of the loan on buildings located in any SFHA in participating NFIP communities. However, the 1994 Reform Act has not had a substantial impact in increasing flood insurance purchases.

A 2013 Congressional Research Service report suggested that only 18 percent of Americans in flood zone areas have flood insurance, indicating that other factors, aside from flood insurance, are driving individuals to develop in the floodplain. This report found that "despite the existence of this mandatory flood insurance purchase requirement, take-up rates for flood insurance have historically been low and the Federal government's exposure to uninsured property losses from flooding remains substantial. Many homeowners do not completely recognize or internalize their flood risk and are overly optimistic about the magnitude of the flood risk to which they are exposed. Consequently, the NFIP has not achieved the level of individual participation originally envisioned by Congress." (Congressional Research Service, 2013).

The literature on risk perception indicates that public perceptions about low frequency/high damage events, such as flooding, imply that the availability of flood insurance may do little to encourage floodplain development because property owners frequently have an "optimistic bias" — a tendency to view themselves as invulnerable, or less likely than others, to experience negative life events such as flood damage (American Institutes for Research - Rosenbaum, W., 2005). There is evidence that many homeowners are either not fully aware of the risk of a flood occurring or that they discount the cost of a flood if it occurs. In some cases, owners simply underestimate the risk of flooding. Rosenbaum (2005) notes that many studies find homeowners underestimate the risk of floods and even when informed, few owners react to offset the risk (American Institutes for Research - Rosenbaum, W., 2005). For example, Chivers and Flores (2002) surveyed homebuyers in Boulder, Colorado and found a market failure of information in which homeowners did not fully understand the flood risks or cost of insuring against the risk when purchasing their homes (Chivers and Flores, 2002). Michel-Kerjan (2010) also noted that, despite the occurrence of floods or natural disasters, homeowners take no action to fortify their homes, likely due to "a lack of accurate knowledge about risk; budget constraints; and myopia" (Michel-Kerjan, 2010). This effect is evident through the actions of homeowners. Michel-Kerjan, Lemoyne de Forges, and Kunreuther (2012) found that homeowners allowed their flood policies to lapse typically after two to four years, even for federally-backed mortgages that require flood insurance.[15] This occurs despite the rule prohibiting individuals from applying for disaster assistance a second time unless flood insurance has been maintained (Michel-Kerjan, Lemoyne de Forges, & Kunreuther, Policy Tenure Under the U.S. National Flood Insurance Program, 2012).

Although more than 22,000 communities participate in the NFIP, the level of policy uptake within those communities demonstrates that flood insurance availability is not a key driver of individual behavior. A 2006 American Institutes for Research (AIR) report provides a number of data points on the level and concentration of policies within the States, territories, and participating communities that demonstrates this point (American Institutes for Research - Monday et al., 2006). A substantial literature review concerned with the public's perceptions about low frequency/high damage events, such as flooding, also implies that the NFIP and flood insurance may do little to influence floodplain development. In 1982, a GAO study concluded that although much development is occurring in the floodplain, flood insurance is not the principal reason for that development. In an interview of 115 people, including 12 Federal officials, 46 State and local government officials, and 57 business people and private citizens, not one person cited flood insurance as the principal factor encouraging their respective decisions to develop in the floodplain (Comptroller of the United States, 1982).

> The 2006 AIR report found that out of approximately 20,000 communities participating in the NFIP at the time of the report,
>
> • 3,452 communities had no flood insurance policies whatsoever;
>
> • Half of the communities had fewer than 10 flood insurance policies each, and 2/3 of the communities had fewer than 20 policies each;
>
> • Five states – California, Florida, Louisiana, New Jersey, and Texas -- accounted for nearly 70% of all NFIP policies; and
>
> • Even within these five states, policies were often concentrated in certain areas. For example, Florida had 437 participating communities, but over half of the policies were concentrated in just 20 of those communities. (American Institutes for Research - Monday et al., 2006)

Looking more broadly to the link between the implementation of the NFIP generally and floodplain development, the studies have not shown that there is any demonstrable connection. For example, GAO analyzed floodplain development data both before and after a community entered the NFIP. GAO used (1) available Bureau of the Census data on population, per capita income,

[15] For loans made by federally regulated lenders, lenders are responsible for enforcing the flood insurance requirement. However, as explained by Michel-Kerjan, Lemoyne de Forges and Kunreuther (2012), some banks do not ensure the policies remain in force.

and new housing units authorized by building permits and public contracts in the United States and (2) building permits that the six selected communities reportedly issued. GAO's analysis concentrated on population growth and increases in housing units authorized for construction. GAO compared the rate of population growth in a 20-year period with the dates the communities entered the program. Generally, the communities were growing before their entrance into the program from 1960 to 1970, and this rate of growth continued from 1970 to 1980.

GAO obtained data on new housing units authorized for a 10-year period for the Nation and the three larger communities, but GAO was only able to obtain this data from 1977 to 1980 for the three smaller communities. New housing units authorized were increasing in all three larger communities prior to their entrance into the flood insurance program and continued to increase thereafter. GAO was unable to attribute the rate of increase in new housing units authorized to the availability of flood insurance because of the many other factors that promote community development. The GAO found that annual increases and decreases in new housing units authorized generally paralleled the rise and decline of total housing units authorized in the Nation and seemed to be more directly related to the state of the economy than the availability of flood insurance.

AIR took a different approach and looked at floodplain development in areas where flood insurance is available compared to areas in which it is not available (e.g., CBRS units). In this study, AIR found that available evidence suggests many CBRS units have been developed, often quite extensively, despite the absence of NFIP flood insurance. The report noted that development appeared to result from a combination of State and local government incentives and market forces. For example, units in Bethany Beach, Delaware, North Topsail Beach, North Carolina, and Cape San Blas, Florida, studied in 1997 developed very much like nearby non-System areas. The report further found that market forces appear to be an increasingly potent source of developmental pressure on CBRS units as undeveloped coastal barrier land becomes increasingly scarce. (American Institutes for Research - Rosenbaum, W., 2005)

As reported in the FEMA Floodplain Management Losses Avoided Study, more than half (57 percent) residential properties located in SFHAs were built prior to the inception of the NFIP. As such, it is clear that development has occurred, and would continue to occur, in the SFHA even in the absence of flood insurance. Thus, the research and empirical evidence demonstrate that the availability of flood insurance has very little effect on the on the motivation to develop the floodplain, which was already well established prior to the inception of the program. (Federal Emergency Management Agency, 2014d)

### 3.6.2 NFIP Flood Insurance Premium Rates and Phase Out of Subsidies

Environmental advocacy organizations have frequently asserted that inexpensive NFIP premiums encourage development in high-risk flood zones, particularly in coastal areas, that might not otherwise occur. Commonly suggested remedies include increasing NFIP premiums to reflect the true flood risk to the property (Pew Oceans Commission 2003, 58). Additionally, according to initial research, one major obstacle for private market insurers entering the flood insurance market has been the inability of private carriers to compete with subsidized premiums that are offered by the NFIP for certain properties (i.e., pre-FIRM buildings) (Insurance Journal, 2014). While private insurers have the capacity to provide coverage for flooding risk and can price more accurately using better modeling tools, the lower premium rates offered by the NFIP have hindered their entrance into the market.

However, industry experts and reports have found that private insurers may be willing to write significant amounts of flood business if they are allowed to charge actuarially sound rates (Insurance Journal, 2014). According to the Fitch Ratings Report, if and when Federal subsidies

for flood insurance are reduced and the cost of government provided flood insurance goes up, the demand for private flood coverage is projected to rise (Insurance Journal, 2014).

Following Biggert Waters, HFIAA, and initiation of the phase out of flood insurance subsidies for pre-FIRM properties, a number of private insurance companies are beginning to offer private flood insurance at competitive rates. With the introduction of private flood insurance into the Government dominated market, flood insurance rates are expected to become competitive and result in better policies and pricing for homeowners. Both Lloyd's of London and The Flood Insurance Agency (TFIA) are offering flood insurance policies in 33 States. The TFIA predicted an expansion from $500M in insured property to $1B by the end of 2014 (Hurtibise, 2014). Other insurance companies offering private flood insurance policies are Homeowners Choice Property & Casualty Insurance, who has just expanded their coverage area to include the State of Florida, Gridiron Insurance Underwriters, and Chubb Personal Flood Insurance. A number of private insurance providers also provide flood coverage that exceeds the maximum allowable limits statutorily authorized for the NFIP ($250,000 for structural damage and $100,000 for contents for residential properties, as well as $500,000 each for structure and contents for non-residential properties) (Insurance Journal, 2014).

Even for non-subsidized policies (i.e., policies on post-FIRM buildings), premium rates are also increasing substantially from the recent legislative changes. As a result of Biggert Waters, FEMA is required to establish a Reserve Fund for the purpose of meeting the expected future obligations of the flood insurance program. FEMA funds this account through a Reserve Fund Assessment added to the premium on NFIP policies. The Reserve Fund Assessment was introduced in October 2013 as a 5 percent assessment on all policies, and there is now a 15% assessment on all policies. That percentage is expected to increase until the annual collections from that Assessment reaches the statutory minimum amount, which at the time it was introduced was about $1 billion annually. Additionally, as a result of HFIAA, all policyholders have to pay a surcharge of $25 for policies on a primary residence and $250 on all other policies. As such, even for non-subsidized policies, the market has grown significantly more competitive, and with the addition of these fees and surcharges, the NFIP is unlikely to be the most competitive insurer on the market in many cases.

Biggert Waters further removed obstacles to private market flood insurance by amending the Flood Disaster Protection Act of 1973 to allow federally-backed lenders to accept private flood insurance in satisfaction of the mandatory purchase requirement (42 U.S.C. § 4012a). Communities do not need to participate in the NFIP to ensure their eligibility for Federal assistance. As long as the purchase of flood insurance is required as a condition of receiving federally-backed loans and Federal assistance in special flood hazard areas, it is irrelevant whether that flood insurance is provided through the NFIP or through the private flood insurance market.

Private market participation has already increased significantly and will likely continue to do so as the NFIP moved further towards actuarial rates. To the extent that the availability of flood insurance has an influence on floodplain development, the private market will increase its influence in that respect. More to the point, as the market for private flood insurance grows, any influence the availability of NFIP flood insurance, in particular, may have on floodplain development would diminish since even without participating in the NFIP, a community would still have access to flood insurance at the same price, but without the additional burden of compliance with the minimum floodplain management regulations and government-imposed assessments, fees, and surcharges.

### 3.6.3 NFIP's Role in Restricting Floodplain Development

There is some evidence that the NFIP discourages development in the SFHA through its floodplain management and flood hazard mapping activities (Rosenbaum & Boulware, 2006). NFIP participating communities must incorporate the NFIP's minimum floodplain management criteria into local laws and ordinances and ensure that development within the SFHA is compliant with those local laws and ordinances. However, NFIP participating communities can adopt more stringent standards and are encouraged to do so. Under the CRS, communities can get discounts on their flood insurance premiums for the adoption of higher regulatory standards. Additionally, flood hazard mapping promotes awareness of flood hazards, which can help to discourage floodplain development in areas where there is a significant risk of flooding. Each of these is discussed in detail in the subsections below.

However, even where development in the SFHA is discouraged, studies have shown that such development is likely to be displaced to non-floodplain locations, generally within the same community, rather than foregone altogether. This was considered the likely outcome of floodplain regulations at least as early as the 1981 FEMA study, *Evaluation of the Economic, Social and Environmental Effects of Floodplain Regulations* (Federal Emergency Management Agency, 1981). The conclusion of that study was based on projected impacts of different regulatory scenarios on future development in 21 case study communities across the U.S. This conclusion held even in communities with developable land constraints (e.g., steep topography).

### 3.6.4 Floodplain Management

#### 3.6.4.1 Floodplain Management Criteria

Under the NFIP regulations, participating NFIP communities are required to regulate all development in FEMA-mapped SFHAs. Before a property owner can undertake any development in the SFHA, a permit must be obtained from the community. The community is responsible for reviewing the proposed development to ensure that it complies with the community's floodplain management ordinances and that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law. For many communities, if a "regulatory floodway" is required, the floodway must be designed to follow established guidelines under the NFIP. Once a floodway is designated, the community must only allow development in the floodway that would not cause an increase in flood heights. A 2006 AIR report found that in many communities, the NFIP has often restrained development in high-hazard floodplains and promoted safer construction in flood-prone areas through its floodplain management requirements (American Institutes for Research - Monday et al., 2006).

#### 3.6.4.2 Community Rating System

A component of the NFIP that encourages conservation of floodplain resources and may benefit species listed as threatened or endangered and critical habitats is the CRS, which is discussed in Sections 2.1.1 and 6.1.1. The CRS is a voluntary program for recognizing and encouraging community floodplain management activities that exceed the minimum NFIP standards. Under the CRS, flood insurance premium rates are adjusted to reflect the reduced flood risk resulting from community activities that meet the goals of the CRS.

The CRS uses a class rating system to determine flood insurance premium reductions for residents. CRS classes are rated from 10 to 1. As a community engages in additional mitigation activities, community residents become eligible for additional NFIP premium policy discounts. Flood insurance premium rates are discounted in increments of 5 percent (i.e., a Class 1 community would receive a 45 percent premium discount, while a Class 9 community would receive a 5 percent discount (Federal Emergency Management Agency, 2014c).

As premium rates continue to increase as a result of legislative changes under Biggert Waters and HFIAA, CRS will gain increasing importance as a source of flood insurance premium rate discounts. The CRS plays a key role in encouraging floodplain conservation and many of the creditable activities under the CRS may result in increased habitat protection beneficial to ESA species, critical habitat, and EFH. For example, FEMA has issued guidance entitled "CRS Credit for Habitat Protection" to describe the types of habitat protection activities that are eligible for CRS credit and, as such, flood insurance premium discounts. (Federal Emergency Management Agency, 2010)

### 3.6.5 Flood Hazard Mapping

By promoting broad based awareness of the risks associated with living in a floodplain, FEMA's flood hazard maps provide information that can encourage development away from flood hazard areas. FEMA also provides best available data, and upon request by the community, future conditions maps. This information may then be used by the communities and individuals to guide future decision-making regarding floodplain development and can discourage continued development in flood hazard areas.

# 4 LISTED/PROPOSED SPECIES AND DESIGNATED/PROPOSED CRITICAL HABITAT

The habitat classifications described in this chapter include all habitats that support ESA species and designated critical habitats that may be present throughout the U.S. and its territories. The Action Area for this BE is the limit of the jurisdictional boundaries of the NFIP participating communities, including those areas in the United States and territories designated as SFHAs on a FIRM under the NFIP. A separate EFH Assessment is presented in Chapter 5.

The nationwide scope of the NFIP, and the vast geographic extent of the Action Area necessitated a broad, practical, and consistent approach to describing the numerous and varied ESA species and designated critical habitats throughout the U.S. and its territories. To enable an assessment of these resources, and subsequently a determination of effects, this document describes ESA species and designated critical habitat by first assigning them to broad habitat classifications (primary habitats) designed to allow a description of ESA species and designated critical habitats across the U.S. (environmental baseline). The environmental baseline provides a snapshot of a species health and or status at a given time and is used as the biological basis upon which to analyze the effects of the Proposed Action.

## 4.1 Habitat Classifications

FEMA considered various approaches to classify habitats; the approach described in this BE is only one that could be developed.

For example, we initially considered the use of EPA's broad Level I ecological regions that highlight 15 major ecological areas in North America (Environmental Protection Agency, 2013b). However, those 15 ecoregions are divided into 40 habitat classifications developed by the Commission for Environmental Cooperation (CEC) (Commission for Environmental Cooperation, 1997). A higher-level approach with a more manageable number of classifications was needed to describe habitats across the entire U.S.

The Anderson Land Use Classification System describes land uses across the U.S. in broad, simplified terms (Anderson, Hardy, Roach, & Witmer, 1976), and was found to be more suitable for a nationwide approach to classifying habitats. Habitat classifications in this document are based on the Anderson classifications, with some additions and modifications to the names and descriptions of each habitat classification to better fit the needs of this document. The habitat classifications as described here may differ from commonly used terms (rangelands vs grasslands) or similar habitat classifications used for other purposes. For example, "wetlands" as defined in this document are more inclusive than the statutory definition of wetlands applicable to USACE permitting activities under Section 404 of the Clean Water Act. Similarly, although forests occur in both upland and lowland areas, "forest land" as defined here includes only upland forests; lowland forests are included within the "forested wetland" classification.

The 12 main habitat classifications as defined in this document are described below.

### 4.1.1 Wetlands

Wetlands in this BE are separated into forested wetlands and nonforested wetlands. Forested wetlands are defined as perennially or intermittently flooded freshwater and saltwater lowland areas dominated by woody vegetation, such as trees and shrubs. Trees and shrubs present in a forested wetland may be deciduous, coniferous, or a mixture of both. Some typical characteristics of a forested wetland include a complex food web of organisms, canopy cover, leaf litter, hydric soils, hydrophytic vegetation, and the presence of a seasonal or permanent body of water that may be large (rivers, lakes) or small (streams, springs). Forested wetlands include forested

riparian areas, mangrove forests, wooded swamps and bogs, and lowland forested areas with seasonally flooding or water at or near the ground surface for at least part of the year.

Nonforested wetlands are defined as perennially or intermittently flooded freshwater or saltwater lowland areas dominated by herbaceous vegetation, such as mosses and emergent plants, or are not vegetated. Some typical characteristics of a nonforested wetland include a complex food web of organisms, open space, hydric soils, hydrophytic vegetation, and permanently or seasonally wet ground cover, possibly including small water bodies (streams, springs). Nonforested wetlands include freshwater meadows, open bogs, salt marshes, and wet prairies.

### 4.1.2 Fresh Waters

Streams and rivers are defined as freshwater linear bodies of water with perennial or intermittent flows while lakes are typically enclosed bodies of water that have no flow, either natural or manmade (reservoirs). Streams, rivers, and lakes are typically found in lowland areas that may be forested, herbaceous, or non-vegetated. Some typical characteristics of streams, rivers, and lakes include aquatic plants, varying depths, and varying flows.

Estuaries extend inland from the sea, where fresh and salt waters mix to create a brackish (slightly salty) water system. Estuaries are typically found in coastal areas where rivers meet marine waters and include areas below the low water line (National Oceanic and Atmospheric Administration, 2014c). Some typical characteristics of estuaries include a productive ecosystem, aquatic plants, brackish water, and a non-enclosed system.

### 4.1.3 Marine Waters

Marine waters are defined as salt waters along coastlines and include nearshore or offshore waters. Nearshore waters are loosely defined as generally within a few hundred feet of the shoreline; offshore waters occur beyond that point. Marine waters include bays, oceans, and areas below the low water line. Some typical characteristics of marine waters include varying depths, high biodiversity areas (e.g., coral reefs), and a general expanse of open water.

### 4.1.4 Beaches

Beaches are smooth sloping accumulations of sand and gravel along coastal shorelines that typically extend from the low water line to the upper extent of the 100-year flood. Beaches also include foredunes, or the non-vegetated or slightly vegetated (e.g., beachgrass) sand dunes closest to the shoreline. Some typical characteristics of beaches include a linear expanse of open space and a neighboring water body. Beaches can be found on the shorelines of marine waters, bays, estuaries, and lakes.

### 4.1.5 Barren Lands

Barren lands in this BE include inland sandy areas and bare exposed rock. Inland sandy areas are defined as accumulations of sand transported by wind. These areas occur in both mesic and arid areas, usually are sparsely vegetated, and have limited ability to support animal and plant life. Some typical characteristics of inland sandy areas include a barren expanse, sand dunes, and well-drained, sandy soils. Inland sandy areas are typically found in central Florida, and the west, and southwest regions of the contiguous U.S.

Bare exposed rock habitats are defined as accumulations of rock with sparse vegetative cover and a limited ability to support animal and plant life. Some typical characteristics of bare exposed rock include a barren expanse and a generally uneven, steep, and rocky environment. Bare

exposed rock habitat includes exposed bedrock, desert pavement, scarps, talus, slides, volcanic material cover, and rock glaciers.

#### 4.1.6 Caves

Caves are defined as hollows in the ground, especially those that open more or less horizontally into a hill or mountain and include karst caves, lava caves, and abandoned mines. Caves may contain standing or flowing water depending on local aquifers and the hydrologic processes of the area. Some typical characteristics of caves include a cool and dark subterranean environment, speleothems (mineral deposits that form on the cave floor and ceiling), and interconnecting passages (National Oceanic and Atmospheric Administration, 2015f). Small fissures and holes in hill and mountainsides that cannot support a substantial community of organisms are not included in this classification.

#### 4.1.7 Rangelands

Rangelands are defined as areas dominated by upland species grasses and forbs (herbaceous rangeland), shrubs and brush (shrub and brush rangeland), or a mixture of both (mixed rangeland). Most rangelands in are found in the western U.S., but can also be found in the central, eastern, and southeastern regions (where they are usually called grasslands), as well as in Alaska. Vegetation in herbaceous rangeland primarily includes short and tall grasses, bunch grasses, and desert grasses. Vegetation in shrub and brush rangeland primarily includes succulents or xeric vegetation with woody stems. A mixed rangeland will have herbaceous and shrub and brush plants. Some typical characteristics of rangelands include open space, short ground cover, and generally varied topography. Rangelands include, but are not limited to, previously used crop or pasture land, prairies, brushlands, and grasslands.

#### 4.1.8 Forest Lands

Forest lands are defined as areas dominated by upland species of trees that may seasonally lose their leaves (deciduous forest land) or remain green throughout the year (evergreen forest land, which includes tropical hardwoods) or a combination of both (mixed forest land). As defined in this document, the forest land habitat does not include trees characteristic of forested wetlands. Some typical characteristics of forest lands include canopy cover, leaf litter, and a general lack of water bodies.

#### 4.1.9 Perennial Snow or Ice

Perennial snow or ice habitats are defined as areas covered by snow, firn (course compacted granular snow), or ice year-round. This habitat features a barren expanse, freezing temperatures, snowbanks, a lack of vegetation, and glaciers. Perennial snow or ice in the U.S. primarily occurs in Alaska.

#### 4.1.10 Urban/Built-Up Lands

Urban or built-up lands are defined as areas of intensive human use where much of the land is covered by man-made structures and impervious surfaces. Urban or built-up land includes residential, commercial, industrial, and transportation uses and typically has little to no natural vegetation and some level of human presence. The urban or built-up land classification includes cities, towns, highways, communication towers, shopping centers, manufacturing plants, and airports.

### 4.1.11 Agricultural Lands

Agricultural lands are areas primarily used for the production of food and fiber. Some typical characteristics of agricultural land are farming activities, the use of large, mechanized equipment, and tilled or compacted soil. Agricultural lands include cropland, livestock pastures, orchards, vineyards, greenhouse/nurseries, and confined feeding operations.

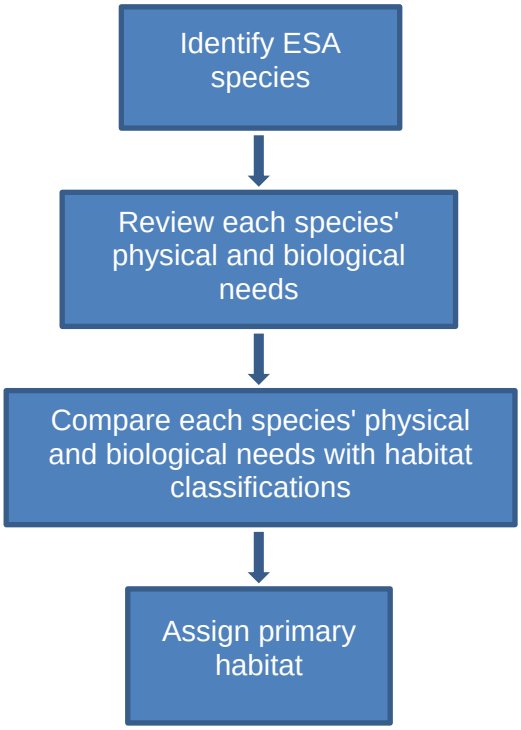
### 4.1.12 Tundra

Tundra is defined as treeless regions beyond the limit of the boreal forest and above the tree line in mountain ranges. Tundra in the U.S. primarily occurs in Alaska. Tundra vegetation includes woody shrubs and brush, sedges, grasses, and mosses. Some characteristics of tundra habitat include a permafrost layer in the soil, short and scarce vegetative cover, and freezing temperatures.

## 4.2 Primary Habitat Classifications that Support ESA Species

Habitats that met the physical and biological needs for at least one ESA species were considered likely to support ESA species (see Figure 4-1). To determine whether a habitat classification is likely to support ESA species, we first identified all species listed or proposed for listing under the ESA (U.S. Government Printing Office, 2015a) (U.S. Government Printing Office, 2015b) (National Marine Fisheries Service, 2015a) (U.S. Fish and Wildlife Service, 2015h). Information on each species' physical and biological needs was then obtained from the Services' websites—the USFWS Environmental Conservation Online System (ECOS) and Information, Planning, and Conservation System (IPaC), and the NOAA Fisheries Office of Protected Resources website. Other sources of information included ESA species' recovery plans and critical habitat designations, and other governmental, academic, and private sources. A team of biologists and ecologists reviewed the information and assigned each species to a primary habitat, defined here as the habitat classification, that meets most or all of a species' physical and biological needs for most or all of its life cycle.

**Figure 4-1: ESA Habitat Classification Process**




Based on this review of ESA species and their physical and biological needs, 9 of the 12 habitat classifications described in this BE were determined likely to support ESA species and critical habitats: wetlands, fresh waters, marine waters, beaches, barren lands, caves, rangelands, forest lands, and perennial snow or ice. Three habitat classifications were determined not likely to support ESA species and critical habitats: urban/built-up lands, agricultural lands, and tundra.

It was necessary to categorize species by primary habitats used, even though a species may use other habitats at various times. For example, endangered Mississippi sandhill cranes are assigned to the nonforested wetlands habitat in this document. These birds may sometimes forage in agricultural fields, but a review of the literature supports a determination that those areas are not considered the primary habitat for this species. Also, because critical habitats are species-

specific and this document assesses broad species groups rather than individual species, designated and proposed critical habitats are considered a subset of the habitats that support ESA species and are not addressed individually.

## 4.3 Habitat Classifications within the Action Area

The extent of the Action Area for this BE is the limit of the jurisdictional boundaries of the NFIP participating communities, including those areas in the United States and its territories designated as SFHAs on a FIRM under the NFIP and nearshore marine waters that may be affected by the Proposed Action.

The FEMA-mapped SFHA is the area where the NFIP's floodplain management regulations must be enforced (Federal Emergency Management Agency, 2014b). The SFHA is defined as "the land within the floodplain subject to a 1 percent or greater chance of flooding in any given year," often referred to as the 100-year floodplain (44 C.F.R. § 59.1). By definition, the SFHA does not extend into waters along the coastline. However, the ESA defines the Action Area as "all areas to be affected directly and indirectly by the Federal action and not merely the immediate area involved in the action" (50 C.F.R. § 402.02). Therefore, although FEMA's regulatory jurisdiction is limited to the SFHAs, the Action Area for this BE includes nearshore marine waters that may be affected by the Proposed Action.

We have adopted a habitat level approach to the description of the baseline condition of ESA species, critical habitats, and EFH. This is necessarily a high-level approach, given the nationwide extent of the Action Area and the myriad ecological conditions present throughout the U.S. and its territories.

Due to the extent of the area covered by this BE—the continental United States, Alaska, Hawaii, and U.S. territories—a modified version of Anderson's broad-scale land use classification system was used to develop 12 habitat classifications and descriptions, as described in more detail in Section 4.1. The classification of habitats in this document also uses SFHA boundaries as the demarcation line for a basic segregation of habitat types needed to analyze effects of the Proposed Action, some of which may occur within or outside of SFHAs. The 12 habitat classifications were divided into lowland/aquatic habitats and upland habitats.

Lowland/aquatic habitats are generally associated with inland waterways or coastlines and typically overlap partially or completely with SFHAs. These habitats (wetlands, fresh waters, nearshore marine waters, and beaches) are anticipated to have a high prevalence in SFHAs nationwide. Upland habitats (barren lands, caves, rangelands, forest lands, and perennial snow or ice) and offshore marine waters are geographically separated from waterways and coastlines and generally have little to no overlap with SFHAs. While upland habitats may sometimes occur within SFHAs, their prevalence in SFHAs nationwide is anticipated to be minimal.

FEMA recognizes that there are exceptions to this generalized approach and that upland habitats may sometimes occur within an SFHA. For example, the floodplain of a large river flowing through an upland rangeland habitat could include fringe areas adjacent to the river and within the SFHA but vegetated with the upland plants characteristic of rangelands. However, while upland habitats may occur within SFHAs, their abundance relative to the amount of lowland habitats within SFHAs is anticipated to be minimal nationwide. The basis for this generalized approach to determining which habitats overlap with SFHAs is provided below.

As part of our review of the EPA ecoregion approach that was initially considered to classify habitats (described in Section 4.1), we obtained National Gap Analysis Program (GAP) land cover spatial data (U.S. Geological Survey, 2011) that is based on the NatureServe Ecological Systems

Classifications (NatureServe Explorer, 2015). We overlaid the GAP data on a map of Ecoregion 11 (Commission for Environmental Cooperation, 1997), to determine which habitat classes overlapped with SFHAs. Ecoregion 11 covers half of California with 22 habitat classifications.

California provides a good model for this comparison because: (1) it has a variety of climates and ecotypes, as well as coastal and inland areas (including deserts, large valleys, alpine mountains, and moist temperate areas); and (2) flood hazard mapping is well developed in a large portion of the State and therefore there is a high level of SFHA representation. Because the Anderson system is only used for classifying (i.e., not mapping) land cover, no spatial data exists. However, as shown in Table 4-1, the Anderson habitat classifications can be generally equated to the GAP land cover data for Ecoregion 11; for example, nonforested wetlands (Anderson classification) are generally equivalent to temperate and boreal freshwater wet meadow and marsh combined with salt marsh (GAP classifications). GAP data were spatially compared to FEMA-mapped SFHAs for Ecoregion 11. A review of the data shows that, in Ecoregion 11, approximately 76 percent of nonforested wetlands and 32 percent of forested wetlands occur in SFHAs. Conversely, approximately 2 percent of forest land and 4 percent of rangeland occurs within SFHAs.

**Table 4-1: Percentage of Habitat Classifications in Ecoregion 11 within SFHAs**

| Anderson Classification used in this BE[1] | GAP Classification for Ecoregion 11[2] | Approximate Percentage that Occurs in SFHAs |
|---|---|---|
| Forested Wetlands | Temperate Flooded & Swamp Forest | 32 |
| Nonforested Wetlands | Temperate & Boreal Freshwater Wet Meadow & Marsh<br>Salt Marsh | 76 |
| Fresh Waters | Open Water<br>Marine & Estuarine Saltwater Aquatic Vegetation | 82 |
| Marine Waters | Not mapped | Not available |
| Beaches | Not mapped | Not available |
| Barren Lands | Polar & Alpine Cliff, Scree & Rock Vegetation<br>Warm Semi-Desert Cliff, Scree & Rock Vegetation<br>Temperate & Boreal Cliff, Scree & Rock Vegetation<br>Mediterranean Cliff, Scree & Rock Vegetation<br>Current and Historic Mining Activity<br>Cool Semi-Desert Cliff, Scree & Rock Vegetation | 4 |
| Caves | Not mapped | Not available |
| Rangeland | Mediterranean Scrub<br>Cool Semi-Desert Scrub & Grassland<br>Mediterranean Grassland & Forb Meadow<br>Warm Semi-Desert Scrub & Grassland<br>Temperate Grassland, Meadow & Shrubland<br>Temperate & Boreal Scrub & Herb Coastal Vegetation | 4 |
| Forest Land | Cool Temperate Forest<br>Warm Temperate Forest | 2 |
| Perennial Snow or Ice | Does not occur in Ecoregion 11 | 0 |
| Urban/Built-up Land | Recently Disturbed or Modified<br>Introduced & Semi Natural Vegetation<br>Developed & Urban | 8 |
| Agricultural Land | Herbaceous Agricultural Vegetation | 31 |
| Tundra | Does not occur in Ecoregion 11 | 0 |

[1]Classifications are adapted from the Anderson Land Use Classification System (Anderson, Hardy, Roach, & Witmer, 1976), with minor modifications.
[2] Sources: (Environmental Protection Agency, 2013b) (U.S. Geological Survey, 2011) (NatureServe Explorer, 2015)

Although this approach proved to be too resource-intensive to be completed for the entire nation, the results of the analysis completed for Ecoregion 11 allow us to demonstrate the relationship of our Anderson habitat classifications relative to SFHAs, and provides justification for our determination of which habitat classifications typically overlap partially or completely with SFHAs.

Table 4-2 shows the habitat classifications and whether they support ESA species or critical habitat, and occur within the Action Area.

**Table 4-2: Habitat Classifications within the Action Area**

| Habitat Classification[1] | Supports Listed/ Proposed Species or Designated/Proposed Critical Habitat? | Occurs in Action Area? |
|---|---|---|
| Wetlands | | |
| Forested Wetlands | Likely | Yes |
| Nonforested Wetlands | Likely | Yes |
| Fresh Waters | | |
| Streams and Rivers | Likely | Yes |
| Lakes | Likely | Yes |
| Estuaries | Likely | Yes |
| Marine Waters | | |
| Nearshore | Likely | Yes |
| Offshore | Likely | No |
| Beaches | Likely | Yes |
| Barren Lands | | |
| Inland Sandy Areas | Likely | Yes |
| Bare Exposed Rock | Likely | Yes |
| Caves | Likely | Yes |
| Rangeland | | |
| Herbaceous Rangeland | Likely | Yes |
| Shrub and Brush Rangeland | Likely | Yes |
| Mixed Rangeland | Likely | Yes |
| Forest Land | | |
| Deciduous Forest Land | Likely | Yes |
| Evergreen Forest Land | Likely | Yes |
| Mixed Forest Land | Likely | Yes |
| Perennial Snow or Ice | Likely | No |
| Urban/Built-up Land | Unlikely | Yes |
| Agricultural Land | Unlikely | Yes |
| Tundra | Unlikely | Yes |

[1] Classifications are adapted from the Anderson Land Use Classification System (Anderson, Hardy, Roach, & Witmer, 1976), with minor modifications.

## 4.4 Species Groupings and Sub-groupings by Primary Habitat

Listed and proposed species were sorted into seven broad species groups using the high-level classifications from both USFWS and NMFS species listings: mammals, birds, reptiles, amphibians, fish, invertebrates, and plants. Within each group, species were further assigned to sub-groups based on primary habitat (see Section 4.2). In this document, primary habitat is defined as meeting most or all of a species' physical and biological needs for most or all of its life cycle.

The following will be described for each species sub-group:

- Identification of the Service (USFWS or NMFS) with jurisdiction over species in the sub-group;
- Description of the primary habitat, whether that habitat occurs within the Action Area (see Section 4.3), and how that habitat meets the physical and biological needs of the species which occupy it;
- General descriptions of dietary, breeding, migration, and overwintering needs of species;
- Number of listed and proposed endangered and threatened species, and the number with designated or proposed critical habitat; and
- Threats to the species sub-group.

At the end of each main species group discussion, all listed and proposed species in the group are presented in a table arranged by sub-groups that provides common and scientific names, status (endangered, threatened, or proposed), State(s) within which the species is/has been found, and whether critical habitat has been designated or proposed for the species.

## 4.5 Mammals

Mammals are warm-blooded vertebrates of the class Mammalia. Distinguishing characteristics of mammal species includes giving birth to live young, mammary glands on females, and the presence of hair at some stage of development. Mammals in the U.S. range in size from tiny bats and shrews to the enormous blue whale. Because mammalian young are dependent on mothers for nourishment, they learn to copy their elders; thus, mammals have great behavioral adaptability. Because they are warm-blooded, mammals also have the ability to physically adapt to a wide range of climates and conditions.

This species group has eight sub-groups: wetland mammals, nearshore marine mammals, offshore marine mammals, beach mammals, barren land mammals, rangeland mammals, forest land mammals, and perennial snow or ice mammals. Almost all mammal species are under the jurisdiction of USFWS; marine mammals, except for sea otters and manatees, are regulated by NMFS (National Marine Fisheries Service, 2015a).

### 4.5.1 Wetland Mammals

Information on wetland mammals has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1983a) (U.S. Fish and Wildlife Service, 1997b) (U.S. Fish and Wildlife Service, 1997c) (U.S. Fish and Wildlife Service, 1998c) (U.S. Fish and Wildlife Service, South Florida Ecological Services Office, 2007) (U.S. Fish and Wildlife Service, 2007a) (U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, 2010a) (U.S. Fish and Wildlife Service, 2014o) (U.S. Fish and Wildlife Service, Southwest Region, 1990) (U.S. Fish and Wildlife Service, 1998l).

Wetland mammals include large predators, small ground mammals, bats, and deer. These species occupy forested or nonforested wetlands. The shrews, voles, beaver, and some mice species are fossorial, and spend the majority of their time in underground burrows, bats roost in caves or trees and forage in riparian areas, while the rest of these wetland species spend the majority of their time foraging in the forested areas or dense grasses and vegetation near surface waters of the wetland. Some species are generally active year-round, while other species hibernate during the winter months in dense vegetation or burrows. Most of the small wetland mammals, as well as the deer species, are herbivores, foraging on grasses, seeds, roots, bark, and other plant matter. The shrew and rat species are omnivorous and include insects and other small invertebrates in their otherwise herbivorous diet, while bats tend to be insectivores. The large predators (feline, bear, and wolf species) are carnivorous and prey on small mammals and birds, ungulates, and fish.

The large wetland predators and small wetland mammals generally remain solitary unless mating or rearing young. Other small wetland mammals such as voles tend to spend most of their time with small family-based groups, becoming solitary when they are ready to mate or give birth. During mating season, deer species form herds and bat species will often roost in small groups or become solitary for a short time. Reproduction times are highly variable among the wetland mammal species, ranging from autumn to early summer, and can fluctuate depending on temperatures and food availability. Females will typically care for their young until they are weaned.

The habitat needs of the wetland mammals vary widely, but tend to include proximity to water; availability of wetland vegetation for food and cover; and large areas of continuous, unfragmented habitat. Some of the small burrowing mammals require a cool moist environment for their burrows, while other species, including voles and the woodrat, rely on dense ground-level marsh vegetation. Certain vole species have an inability to conserve water and concentrate urine, and therefore require proximity to water sources. The large predators rely on sizeable areas of unfragmented habitat to provide feeding, reproduction, and shelter needs.

Of the 22 wetland mammal species, 20 are endangered and 2 are threatened. Critical habitat has been designated for seven species.

The following representative threats to wetland mammals have been synthesized from information available for several species:

- Loss and degradation of habitat from urban development, agriculture, logging, filling, and other human development activities;
- Naturally occurring disease and parasites;
- Extreme and adverse weather conditions (such as hurricanes, floods, or storms);
- Invasive plants changing the composition and quality of habitat;
- Invasive wildlife creating competition for food and habitat;
- Low genetic diversity and viability due to isolation and small population size;
- Predation of adults and young by snakes, birds, and feral cats can occur from nearby human development providing food and water for predators and increasing their abundance; and
- Illegal hunting of large carnivores for sport or to protect livestock.

### 4.5.2 Nearshore Marine Mammals

Information on nearshore marine mammals has been synthesized from a variety of sources: (National Marine Fisheries Service, 2007a) (U.S. Fish and Wildlife Service, 2013e) (National Marine Fisheries Service, 2014i) (U.S. Fish and Wildlife Service, 2014l) (National Marine Fisheries Service, 2008b).

Nearshore marine mammals include manatees, sea lions, sea otters, seals, the killer whale, and the beluga whale. All nearshore marine mammals fall under the jurisdiction of NMFS except for sea otters and manatees, which are regulated by USFWS (National Marine Fisheries Service, 2015a).

In general, nearshore marine mammals live in bays and nearshore ocean waters, though manatees and beluga whales will travel between freshwater (estuaries and river basins) and marine environments. While killer whales are often pelagic, the only resident population known to occur in the U.S. (the southern resident killer whales) spends much of its time in shallow, coastal, and nearshore marine waters, where critical habitat has been designated (National Marine Fisheries Service, 2015f). The nearshore marine mammals spend most of their time traveling and foraging in the aquatic environment and usually breed and rest on beaches and rocky shores. The manatee is herbivorous with a diet consisting primarily of aquatic grasses and algae. Seals, sea lions, and sea otters are generally predatory, feeding primarily on fish, mollusks (cephalopods, bivalves), and crustaceans. Sea lions also occasionally eat birds and other marine mammals. Beluga whales feed on a variety of marine organisms such as fish, crustaceans, and squid.

These nearshore marine mammals are generally communal animals and may rest, feed, breed, and migrate in groups. The movement of sea otters tends to vary depending on the size and social structure of a population, but they can travel long distances within their home ranges. Certain marine mammals, such as sea lions, will migrate to follow their food sources, often moving from pelagic to nearshore waters. Beluga whales and seals tend to breed in the spring and sea lions during the summer, whereas breeding manatees have been reported in all seasons. While the whales and manatees are strictly aquatic, seals, sea otters, and sea lions will typically mate and give birth in coastal areas, on sandy or rocky beaches. Females care for their young until they are weaned and independent; the young, upon reaching adulthood, sometimes become incorporated into the same communal group as their parents. Males in most of these nearshore marine species typically provide little paternal care.

The habitat needs of the nearshore marine mammals vary among the species. Because marine mammals spend most of their time in aquatic environments, they require good water quality. Seals, sea otters, and sea lions also rely on undisturbed coastal habitats to mate and give birth.

Of the seven nearshore marine mammal species, five are endangered and two are threatened. Critical habitat has been designated for five species.

The following representative threats to marine mammals have been synthesized from information available for several species:

- Loss and modification of beach nesting habitat due to urban development, beach armoring, and dredging;
- Contamination of the marine environment by herbicides, pesticides, heavy metals, oil spills, and human trash/waste;
- Entrapment and entanglement in fishing equipment;
- Disturbance by and collision with recreational and commercial vessels;

- Changes in habitat (water temperature, sea levels), which may be amplified by climate change; and
- Slow recovery from significant population declines due to historical overhunting.

### 4.5.3 Offshore Marine Mammals

Information on offshore marine mammals has been synthesized from a variety of sources: (National Marine Fisheries Service, 1985) (National Marine Fisheries Service, 1991) (National Marine Fisheries Service, 1998) (National Marine Fisheries Service, 2010) (National Marine Fisheries Service, 2011) (National Marine Fisheries Service, Northwest Regional Office, 2008).

Offshore marine mammals include several species of whales, the spotted seal, and the Guadalupe fur seal, all of which are under the jurisdiction of NMFS (National Marine Fisheries Service, 2015a).

Offshore marine mammals live in deep, offshore open ocean waters and spend most of their time traveling and foraging in the aquatic environment. The spotted seals will also climb onto the outer margins of ice floes and Guadalupe fur seals are found in caves and coastal rocky habitats during breeding season. The baleen whales (blue, humpback, right, sei, bowhead, and finback), often feed on small crustaceans and plankton (passively floating or weakly swimming, usually minute animal and plant life, found in a body of water) filtering these small organisms (such as krill and copepods) through their baleen bristles. Other whales, including the sperm whale and false killer whale feed on a variety of marine organisms such as fish, crustaceans, and squid (National Oceanic and Atmospheric Administration Office of Protected Resources, 2015b). The seals feed by diving for squid, crustaceans, mackerel, and other fish.

With the exception of Guadalupe fur seals, which are solitary animals, the offshore marine mammals are generally communal and may rest, feed, breed, and migrate in groups. Whales tend to migrate considerable distances between summering and wintering areas. Mating and breeding times are variable among the offshore marine mammal species, with some species, including sei whales, breeding in early winter, spotted seals breeding during the winter and spring, and Guadalupe fur seals breeding during the summer. Females care for their young until they are weaned and independent; the young, upon reaching adulthood, sometimes become incorporated into the same communal group as their parents. While males in most of these marine species typically provide little paternal care, certain whale species will travel in small family groups called "pods" that consist of the male, female, and their calves. Spotted seals also form family groups during the breeding season, consisting of a male, female, and the pup.

The habitat needs of the offshore marine mammals vary among the species. Because these marine mammals spend their lives in aquatic environments, they require good water quality. The species that spend the majority of their time in open ocean waters tend to require large areas undisturbed by humans, particularly vessels.

Of the 11 offshore marine mammals, 9 are endangered and 2 are threatened. Critical habitat has been designated for two species.

The following representative threats to offshore marine mammal have been synthesized from information available for several species:

- Contamination of the marine environment by herbicides, pesticides, heavy metals, oil spills, and human trash/waste;
- Entrapment and entanglement in fishing equipment;
- Disturbance by and collision with recreational and commercial vessels;

- Changes in habitat (water temperature, sea levels), which may be amplified by climate change; and
- Slow recovery from significant population declines due to historical overhunting.

### 4.5.4 Beach Mammals

Information on beach mammals has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1987a) (U.S. Fish and Wildlife Service, 1993c) (U.S. Fish and Wildlife Service, 2010a) (U.S. Fish and Wildlife Service, Region 1, 1998).

Beach mammals include several species of mice that live near bays and estuaries on beaches, foredunes, and coastal bluffs that are lightly vegetated with grasses and scrub. These mice typically live in burrows dug in the sand and are herbivorous, eating primarily seeds, beachgrasses, and sea oats. Beach mice may also occasionally eat invertebrates, especially in the late winter and early spring when seeds are scarce.

Beach mice tend to establish small home ranges and usually remain there for the duration of their lives. They are typically nocturnal, moving around within their home range at night to forage, breed, and maintain the various burrows within the range. Male and female beach mice typically form a mated pair bond for life (monogamous), but they are generally territorial of their burrow range and do not typically associate with other beach mice outside of their mated pair. Breeding and reproduction tends to peak in the winter. Females typically provide care until the young are weaned and independent. The habitat needs of beach mice include sandy coastal dunes and nearby scrub habitat, as they build their burrows into the sloping sides of dunes. Beach mice also require proximity to beach vegetation, including grasses.

Of the seven beach mammal species, six are endangered and one is threatened. Critical habitat has been designated for four species.

The following representative threats to beach mammals have been synthesized from information available for several species:

- Habitat destruction or disturbance from commercial, residential, and recreational development of beaches and coastal areas;
- Mortalities from motor vehicles, including off-road vehicles (ORVs);
- Extreme and adverse weather conditions (hurricanes, storms);
- Loss of coastal habitat to erosion and sea level rise;
- Predation by raptors, snakes, raccoons, and feral cats, dogs, and pigs. Nearby human development can provide food and water for predators, increasing their abundance.

### 4.5.5 Barren Land Mammals

Information on barren land mammals has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1998d) (U.S. Fish and Wildlife Service, Region 1, 2000) (U.S. Fish and Wildlife Service, 2007b).

Barren land mammals are pronghorns and bighorn sheep that occupy arid upland, rocky, and sandy habitats. Pronghorn prefer inland sandy areas and bighorn sheep prefer bare exposed rock areas.

Species in this sub-group find shelter from the arid environment in ephemeral washes, caves, or shade from boulders, cliffs, or vegetation. Barren land mammals generally have herbivorous diets

of cacti, sedges, grasses, mesquite, and flowering desert plants. Water sources are rarely needed as these animals obtain sufficient water from plants they eat.

Barren land mammals will rest and feed in intraspecies (same species) groups and are often most active in the early morning and late evening. These hooved mammals are agile on rocky, steep, and mountainous slopes and use the visibility of the open terrain and steep slopes of their habitat to escape from predators. The bighorn sheep will often migrate seasonally between high and low elevations. Pronghorns do not typically migrate but may travel outside their home range to forage.

Reproduction typically occurs in seasons when there is more rain and therefore a greater abundance of food. Females of both pronghorns and bighorn sheep bed in caves or in the shade of cliffs or available vegetation and will give birth in secluded areas, often on treacherous terrain to protect their young. Young generally receive paternal care until they are weaned and independent.

The habitat needs of the barren land mammals include succulent cacti, grasses, and other plants for foraging, along with areas of shade or shelter. Bighorn sheep are wide-ranging animals that require steep topography to escape from predators and open terrain for good visibility. Bighorn sheep also need areas of flat land for easy access to other mountain ranges, and therefore other sources of food and breeding gene pools. Pronghorns also require open terrain for good visibility but prefer areas where topography is generally level.

All three of the barren land mammals are endangered. Critical habitat has been designated for two species.

The following representative threats to barren land mammals have been synthesized from information available for several species:

- Loss or modification of habitat from urban development, mining, livestock grazing, agriculture, and other human development activities;
- Declines in available food sources, either due to natural causes or human-induced habitat loss;
- Mortalities from motor vehicles, including ORVs;
- Predation by mountain lions and coyotes. Nearby human development can provide food and water for predators, increasing their abundance; and
- Changes in habitat (rainfall amounts, temperature).

### 4.5.6 Rangeland Mammals

Information on rangeland mammals has been synthesized from a variety of sources (U.S. Fish and Wildlife Service, 1991a) (U.S. Fish and Wildlife Service, 1995a) (U.S. Fish and Wildlife Service, 1997a) (U.S. Fish and Wildlife Service, 1998b) (U.S. Fish and Wildlife Service, 1999b) (U.S. Fish and Wildlife Service, 2003c) (U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, 2009a) (U.S. Fish and Wildlife Service, 2012c) (U.S. Fish and Wildlife Service, 2013c) (U.S. Fish and Wildlife Service, 2013d) (U.S. Fish and Wildlife Service, 2014n) (U.S. Fish and Wildlife Service, 2012d) (U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office, 2014) (U.S. Fish and Wildlife Service, 2011e).

Rangeland mammals occupy upland, open space habitats dominated by grasses and herbaceous growth (i.e., grasslands), shrubs and brush, or a mixture of both. The rangeland mammals include several species of kangaroo rats, pocket gophers, foxes, and two species of jagaurundi, as well as one species of bison, rabbit, ferret, ground squirrel, prairie dog, and bat.

The small ground mammals (ferret, pocket gophers, prairie dog, ground squirrel, rabbit, kangaroo rats, and vole) are fossorial, spending most of their time in burrows, some of which can have complex underground structures. The one bat species roosts in caves and mines.

The foxes, ferrets, and jaguarundis prey on small mammals, such as prairie dogs, rabbits, and ground squirrels. The other rangeland mammals are herbivorous, foraging on grasses, seeds, and other plant materials. The bat feeds on nectar, pollen, and fruit of cacti and agave plants.

The level of social interactions and communal living varies among the rangeland mammals. The jaguarundis, foxes, ferret, and kangaroo rats remain solitary unless mating, while the other species tend to form groups, some of which have complex communal structures. Some of the small, fossorial rangeland mammals hibernate in the colder months. Breeding seasons vary widely among these species, for example, between early spring and early summer for kangaroo rats, November and December for jaguarundis, mid-March and early April for ferrets, and July and October for bison. With the exception of the foxes, males typically provide little to no paternal care; females care for young until they are weaned and independent.

The habitat needs for the rangeland mammals vary widely. For example, kangaroo rats need sandy, well-drained soils for burrowing, the rabbit is dependent on tall, dense stands of sagebrush for food and shelter year-round, the bat needs a habitat with roosting sites in caves or mines, and foxes require an established population of small mammals for prey. Large, unfragmented areas of habitat are important for several of these rangeland mammals, such as the bison and pocket gophers, as isolated populations are at a greater risk of extinction.

Of the 24 rangeland mammal species, 17 are endangered and 7 are threatened. Critical habitat has been designated for seven species.

The following representative threats to rangeland mammals have been synthesized from information available for several species:

- Loss and fragmentation of habitat due to agriculture, industrial development, urban development, recreation, and other human development activities;
- Predation by raptors, snakes, coyotes, and weasels. Nearby human development can provide food and water for predators, increasing their abundance;
- Native and invasive wildlife competing for food and habitat;
- Contamination of the rangeland environment from pesticides, herbicides, rodenticides, and other agricultural pollutants;
- Invasive plants changing the composition and quality of habitat and altering food abundance; and
- Disease and parasites, such as the non-native sylvatic plague disease that caused a historical drop in prairie dog and ferret populations.
- Disease, such as the canine distemper virus that caused a drop in an island fox population and is believed to have been transmitted through infected raccoons.

### 4.5.7 Forest Land Mammals

Information on forest land mammals has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1982c) (U.S. Fish and Wildlife Service, 1984d) (U.S. Fish and Wildlife Service, 1990a) (U.S. Fish and Wildlife Service, 1990g) (U.S. Fish and Wildlife Service, 1993a) (U.S. Fish and Wildlife Service, 1993b) (U.S. Fish and Wildlife Service, 1994a) (U.S. Fish and Wildlife Service, 2005c) (U.S. Fish and Wildlife Service, South Florida Ecological Services Office,

2008) (Northern Continental Divide Ecosystem, 2013) (U.S. Fish and Wildlife Service, 2014p) (U.S. Fish and Wildlife Service, Oregon Fish & Wildlife Office, 2015) (U.S. Fish and Wildlife Service, 2015i) (U.S. Fish and Wildlife Service, 2015k).

Mammals in this sub-group include large predators (bears, lynxes, and wolves), rodents (woodrats, mice, and squirrels), caribou, and bats that occupy upland forested habitats dominated by trees – deciduous, evergreen, or mixtures of the two. Forest land rodents can often be found on the forest floor. The squirrels also tend to nest in tree cavities while woodrats use rock crevices and piles to create stick nests. Bats can also be found in caves. Wolves are wide-ranging mammals that may use other habitats, as well, such as tundra and grasslands. Forest land mammals tend to be crepuscular (active at dawn and dusk) or nocturnal (active at night). Certain species, particularly the rodents and caribou, are herbivorous, having a diet consisting of fruit, seeds, leaves, and other plant matter, while others, including the bats, lynxes, and wolves, are carnivorous, primarily preying on insects, rabbits, or other small mammals. The diet of bears can include plants, mammals, fish, insects, and more. Caribou and squirrels eat the wood-borne fungi and lichens on mature trees. Fishers are opportunistic predators that eat small mammals and birds, and occasionally plant material.

Some forest land mammals, primarily rodents, bats, and bears, hibernate in the colder months. Hibernating mammals can usually be found in caves, leaf litter, or in underground burrows (either existing or created). Bears tend to dig dens on steep slopes. Certain bats in this sub-group may migrate to a warmer location instead of hibernating.

Several forest land species, including the bears and fisher, are solitary except when mating and rearing young, whereas the wolves, caribou, bats, and several rodent species, such as the squirrels, tend to form groups. Breeding and reproduction times vary among the forest land mammals, but tend to occur during the warmer months and can fluctuate depending on temperature and food availability. Bears tend to breed from May through July. Woodrats tend to breed in the summer while the wolves and bats breed during the winter. Most males in this sub-group generally leave the female after mating and provide little paternal care. However, both male and female wolves will bring food to their young. Females will typically care for young until they are weaned and independent.

The habitat needs of forest mammals vary widely. For instance, the flying squirrels require mature trees and down snags for movement, nesting in cavities, and wood-borne fungi and lichens for food. In addition, many species, including the large predators, require large areas of unfragmented forest habitat, as isolated populations and gene pools increase the risk of extinction. These predators also rely on the ability of the forest habitat to support populations of their prey.

Of the 18 forest land mammal species, 12 are endangered, 3 are threatened, 2 are proposed endangered, and 1 is proposed threatened. Critical habitat has been designated for six listed species.

The following representative threats to forest land mammal have been synthesized from information available for several species:

- Loss and modification of habitat from urban development, agriculture, timber harvest, and other human development activities;
- Disturbance of breeding and nesting activities by human recreational activities (such as caving, camping, or use of off road vehicles);
- Predation by feral cats, snakes, and birds. Nearby human development can provide food and water for predators, increasing their abundance;

- Extreme and adverse weather conditions (temperature, rainfall);
- Invasive plants and insects changing the composition and quality of habitat;
- Native and invasive wildlife creating competition for food and habitat; and
- Disease and parasites.

### 4.5.8 Perennial Snow or Ice Mammals

There are two animals assigned to the perennial snow or ice habitat, the polar bear and the ringed seal; information has been taken from the Federal Register notice of critical habitat designation for polar bear (U.S. Fish and Wildlife Service, 2010b) and the final rule to list ringed seal (National Marine Fisheries Service, 2012).

Polar bears in the U.S. are found in Alaska in upland habitats covered with snow and ice year-round. Polar bears rely on sea ice habitats, including land-fast ice (ice frozen to the land or sea bottom) and pack ice (dynamic ice located in open ocean areas), that provide areas for feeding, travelling, and resting. On land portions of this habitat, snow cover provides insulation and cover for dens.

Polar bears are predatory and feed mainly on fish and seals, including ringed seals, hunting near holes in the ice or from ice platforms. Polar bears forage in open marine waters, and sometimes in bays and estuaries; their movements are influenced by the availability and accessibility of prey. These bears tend to migrate within their range, moving north during the summer and south during the winter, following the movement and formation of sea ice.

Polar bears are typically solitary outside of the breeding season, which generally occurs in the fall and winter months. Pregnant females will bed in snowy dens and care for their young until they are weaned and independent, sometimes for as long as two years. During times of food scarcity, a polar bear can slow its metabolism and will typically create a den in a snowdrift and remain there in a hibernation-like state until food sources are more abundant.

Ringed seals generally spend their entire lives on floating or shorefast ice and in surrounding Arctic waters; they rarely haul-out in beaches or coastlines. Ringed seals also dig dens and give birth in snowdrifts on floating or shorefast ice (National Marine Fisheries Service, 2012). They may be found near shore or further from the coast, depending on the extent and location of suitable floating ice. Ringed seals forage for fish and invertebrates in nearby waters. They are typically solitary animals, except when caring for young.

The polar bear is threatened and has designated critical habitat; the ringed seal is also threatened, but no critical habitat has been designated.

Threats to polar bears and ringed seals include:

- Loss and fragmentation of habitat due to road construction, recreational development, and other human development activities;
- Loss of prey due to contamination of the marine environment by pollutants, particularly petroleum spills;
- Authorized removal of nuisance or dangerous bears near populated areas; and
- Loss of coastal habitat to erosion, melting ice, and sea level rise due to climate change.
- Changes in the extent, thickness, and seasonality of Arctic Ocean ice coverage due to climate change.

Table 4-3 lists all U.S. mammals, by sub-group, which are listed or proposed threatened or endangered, the State(s) in which they are found, and whether critical habitat has been designated for the species.

**Table 4-3: Threatened and Endangered Mammals in the U.S.**

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Wetland Mammals – Occur in the Action Area | | | | |
| Point Arena mountain beaver | *Aplodontia rufa nigra* | E | CA | No |
| Red wolf | *Canis rufus* | E | FL, NC, SC; Presumed extinct in wild | No |
| Florida bonneted bat | *Eumops floridanus* | E | FL | No |
| Ocelot | *Leopardus (=Felis) pardalis* | E | AZ, TX | No |
| Amargosa vole | *Microtus californicus scirpensis* | E | CA | Yes |
| Florida salt marsh vole | *Microtus pennsylvanicus dukecampbelli* | E | FL | No |
| Gray bat | *Myotis grisescens* | E | AL, AR, FL, GA, IL, IN, KS, KY, MO, MS, NC, OK, TN, VA, WV | No |
| Indiana bat | *Myotis sodalis* | E | AL, AR, FL, GA, IA, IL, IN, KY, MD, MI, MO, MS, NC, NJ, NY, OH, OK, PA, TN, VA, VT, WV | Yes |
| Riparian woodrat (=San Joaquin Valley) | *Neotoma fuscipes riparia* | E | CA | No |
| Key deer | *Odocoileus virginianus clavium* | E | FL | No |
| Columbian white-tailed deer | *Odocoileus virginianus leucurus* | E | OR, WA | No |
| Rice rat | *Oryzomys palustris natator* | E | FL | Yes |
| Jaguar | *Panthera onca* | E | AZ, NM | Yes |
| Florida panther | *Puma (=Felis) concolor coryi* | E | FL, LA, AR, SC | No |
| Eastern puma (=cougar) | *Puma (=Felis) concolor couguar* | E | CT, DE, GA, IN, KY, MA, MD, ME, MI, MO, NC, NH, NJ, NY, OH, PA, RI, SC, VA, VT, WV* | No |
| Salt marsh harvest mouse | *Reithrodontomys raviventris* | E | CA | No |
| Buena Vista Lake ornate shrew | *Sorex ornatus relictus* | E | CA | Yes |
| Riparian brush rabbit | *Sylvilagus bachmani riparius* | E | CA | No |
| Lower Keys marsh rabbit | *Sylvilagus palustris hefneri* | E | FL | No |
| Louisiana black bear | *Ursus americanus luteolus* | T | LA, MS, TX | Yes |
| New Mexico meadow jumping mouse | *Zapus hudsonius luteus* | E | AZ, CO, NM | No |
| Preble's meadow jumping mouse | *Zapus hudsonius preblei* | T | CO, WY | Yes |
| Nearshore Marine Mammals – Occur in the Action Area | | | | |
| Beluga whale, Cooks Inlet DPS | *Delphinapterus leucas* | E | AK | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Northern sea otter, Southwest Alaska DPS | *Enhydra lutris kenyoni* | T | AK,WA | Yes |
| Southern sea otter | *Enhydra lutris nereis* | T | CA,OR,WA | No |
| Steller sea lion, Western DPS | *Eumetopias jubatus* | E | WA,OR,CA, AK | Yes |
| Hawaiian monk seal | *Monachus schauinslandi* | E | HI | Yes |
| Killer whale, Southern Resident DPS | *Orcinus orca* | E | CA, OR, WA | Yes |
| West Indian manatee | *Trichechus manatus* | E | AL, FL, GA, LA, MS, NC, PR, SC, TX | Yes |
| Offshore Marine Mammals – Do not occur in the Action Area | | | | |
| Guadalupe fur seal | *Arctocephalus townsendi* | T | CA | No |
| Bowhead whale | *Balaena mysticetus* | E | AK | No |
| Sei whale | *Balaenoptera borealis* | E | CA, MA | No |
| Blue whale | *Balaenoptera musculus* | E | AK, CA, MA | No |
| Finback whale | *Balaenoptera physalus* | E | AK, AL, CA, CT, DE, FL, GA, LA, MA, MD, ME, MS, NC, NH, NJ, NY, PR, RI, SC, VA, VI | No |
| North Atlantic right whale | *Eubalaena glacialis* | E | CT, DE, FL, GA, MA, MD, ME, NC, NJ, NY, RI, SC, VA | Yes |
| North Pacific right whale | *Eubalaena japonica* | E | AK | Yes |
| Humpback whale | *Megaptera novaeangliae* | E | AK, AL, CA, DE, FL, GA, LA, MA, MD, ME, MS, NC, NJ, NY, OR, RI, SC, VA, WA | No |
| Spotted seal, Southern DPS | *Phoca largha* | T | AK | No |
| Sperm whale | *Physeter catodon (=macrocephalus)* | E | AK, CA, NC, PR, VI | No |
| False killer whale, Main Hawaiian Islands Insular DPS | *Pseudorca crassidens* | E | AK, OR, WA, CA, TX, LA, FL, GA, SC, NC, HI | No |
| Beach Mammals – Occur in the Action Area | | | | |
| Pacific pocket mouse | *Perognathus longimembris pacificus* | E | CA | No |
| Choctawhatchee beach mouse | *Peromyscus polionotus allophrys* | E | FL | Yes |
| Alabama beach mouse | *Peromyscus polionotus ammobates* | E | AL | Yes |
| Southeastern beach mouse | *Peromyscus polionotus niveiventris* | T | FL | No |
| St. Andrew beach mouse | *Peromyscus polionotus peninsularis* | E | FL | Yes |
| Anastasia Island beach mouse | *Peromyscus polionotus phasma* | E | FL | No |
| Perdido Key beach mouse | *Peromyscus polionotus trissyllepsis* | E | AL, FL | Yes |
| Barren Land Mammals – Occur in the Action Area | | | | |
| Sonoran pronghorn | *Antilocapra americana sonoriensis* | E | AZ | No |
| Peninsular bighorn sheep | *Ovis canadensis nelsoni* | E | CA | Yes |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Sierra Nevada bighorn sheep | *Ovis canadensis sierrae* | E | CA | Yes |
| Rangeland Mammals – Occur in the Action Area | | | | |
| Wood bison | *Bison athabascae* | T | AK | No |
| Pygmy rabbit | *Brachylagus idahoensis* | E | WA | No |
| Utah prairie dog | *Cynomys parvidens* | T | UT | No |
| Morro Bay kangaroo rat | *Dipodomys heermanni morroensis* | E | CA | Yes |
| Giant kangaroo rat | *Dipodomys ingens* | E | CA | No |
| San Bernardino Merriam's kangaroo rat | *Dipodomys merriami parvus* | E | CA | Yes |
| Fresno kangaroo rat | *Dipodomys nitratoides exilis* | E | CA | Yes |
| Tipton kangaroo rat | *Dipodomys nitratoides* | E | CA | No |
| Stephens' kangaroo rat | *Dipodomys stephensi (incl. D. cascus)* | E | CA | No |
| Gulf Coast jaguarondi | *Herpailurus (=Felis) yagouaroundi cacomitli* | E | TX | No |
| Sinaloan jaguarondi | *Herpailurus (=Felis) yagouaroundi tolteca* | E | AZ | No |
| Lesser long-nosed bat | *Leptonycteris curasoae yerbabuenae* | E | AZ, NM | No |
| Hualapai Mexican vole | *Microtus mexicanus hualpaiensis* | E | AZ | No |
| Black-footed ferret | *Mustela nigripes* | E | AZ, CO, KS, MT, ND, NE, NM, SD, UT, WY | No |
| Northern Idaho ground squirrel | *Spermophilus brunneus* | T | ID | No |
| Roy Prairie pocket gopher | *Thomomys mazama glacialis* | T | WA | Yes |
| Olympia pocket gopher | *Thomomys mazama pugetensis* | T | WA | Yes |
| Tenino pocket gopher | *Thomomys mazama tumuli* | T | WA | Yes |
| Yelm pocket gopher | *Thomomys mazama yelmensis* | T | WA | Yes |
| Santa Catalina Island fox | *Urocyon littoralis catalinae* | E | CA | Yes |
| San Miguel Island fox | *Urocyon littoralis* | E | CA | Yes |
| Santa Cruz Island fox | *Urocyon littoralis santacruzae* | E | CA | Yes |
| Santa Rosa Island fox | *Urocyon littoralis santarosae* | E | CA | Yes |
| San Joaquin kit fox | *Vulpes macrotis mutica* | E | CA | No |
| Forest Land Mammals – Occur in the Action Area | | | | |
| Gray wolf | *Canis lupus* | E | CA, MI, NM, OR, WI, WA | Yes |
| Gray wolf, MN population | | T | MN | No |
| Ozark big-eared bat | *Corynorhinus (=Plecotus) townsendii ingens* | E | AR, MO, OK | No |
| Virginia big-eared bat | *Corynorhinus (=Plecotus) townsendii virginianus* | E | KY, NC, VA, WV | Yes |
| Pacific sheath-tailed bat | *Emballonura semicaudata rotensis* | PE | Northern Mariana Islands | No |
| Carolina northern flying squirrel | *Glaucomys sabrinus coloratus* | E | NC, TN, VA | No |
| Hawaiian hoary bat | *Lasiurus cinereus semotus* | E | HI | No |
| Mexican long-nosed bat | *Leptonycteris nivalis* | E | NM, TX | No |
| Canada lynx | *Lynx canadensis* | T | CA, CO, ID, ME, MI, MN, MT, OR, UT, WA, WI, WY, NH, NY, VT | Yes |
| Fisher | *Martes pennanti* | PT | CA, OR | No |
| Northern long-eared bat | *Myotis septentrionalis* | PE (Listed as T as | AL, AR, CT, DE, DC, GA, IL, IN, IA, KS, KY, LA, | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| | | of 5/4/15) | ME, MD, MA, MI, MN, MS, MO, MT, NE, NH, NJ, NY, NC, ND, OH, OK, PA, RI, SC, SD, TN, VT, VA, WV, WI, WY | |
| Key Largo woodrat | *Neotoma floridana smalli* | E | FL | No |
| Key Largo cotton mouse | *Peromyscus gossypinus allapaticola* | E | FL | No |
| Mariana fruit bat (=Mariana flying fox) | *Pteropus mariannus* | T | GU, NMI | Yes |
| Little Mariana fruit bat | *Pteropus tokudae* | E | GU; Possibly extinct | No |
| Woodland caribou | *Rangifer tarandus caribou* | E | ID, WA | Yes |
| Delmarva Peninsula fox squirrel | *Sciurus niger cinereus* | E | DE, MD, VA, PA | No |
| Mount Graham red squirrel | *Tamiasciurus hudsonicus grahamensis* | E | AZ | Yes |
| Grizzly bear | *Ursus arctos horribilis* | T | ID, MT, WA, WY | No |
| Perennial Snow or Ice Mammals – Although perennial snow or ice habitat does not occur in the Action Area, the polar bear will sometimes forage in estuaries, which do. | | | | |
| Polar bear | *Ursus maritimus* | T | AK | Yes |
| Ringed seal | *Phoca hispida* | T | AK | No |
| Source: (U.S. Fish and Wildlife Service, 2014m) (NatureServe, 2009c)<br>E = Endangered; T = Threatened; PE = Proposed Endangered; PT = Proposed Threatened | | | | |

## 4.6 Birds

Birds are warm-blooded vertebrates of the class Aves, which bear young in a hard-shelled egg and have a body covered with feathers, forelimbs modified into wings, scaly legs, a beak, and no teeth.

This species group is entirely under the jurisdiction of USFWS and includes both migratory and non-migratory birds. Migratory birds travel from one place to another at regular times often over long distances, typically to reach breeding and overwintering areas. Migration allows birds to escape harsh weather or access seasonally available resources. Non-migratory birds are present in the same area year-round and have adapted their feeding and nesting activities to accommodate seasonal changes within that area. There are eight sub-groups of birds: forested wetland birds, nonforested wetland birds, freshwater birds, nearshore marine birds, offshore marine birds, beach birds, rangeland birds, and forest land birds.

### 4.6.1 Forested Wetland Birds

Information on forested wetland birds has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 2010d) (U.S. Fish and Wildlife Service, 2008e) (U.S. Fish and Wildlife Service, 2002c) (U.S. Fish and Wildlife Service, 1997f) (U.S. Fish and Wildlife Service, 1998j).

The members of this sub-group are defined by their dependence on forested wetland areas for breeding, nesting, and foraging habitat. Such areas include riparian forests along waterways, mangrove forests, forested marshes, and forested swamplands. This sub-group consists of passerine (perching birds), cuckoo, woodpecker, kingfisher, and wading bird species. The

passerines and woodpeckers within this sub-group are insectivores, preying on flying insects while in flight or insect larva found on trees, logs, or foliage. Cuckoo and kingfisher species in this sub-group will also consume a large number of insects, but they will also eat small amphibians and reptiles, such as frogs and lizards, as well. Wading birds in this sub-group will primarily feed on larger wetland prey items such as fish. The wading birds in the forested wetland sub-group are communal and often forage and nest in flocks.

Passerine, woodpecker, and cuckoo species in this sub-group generally reproduce in the spring. Kingfisher species in this sub-group will generally reproduce between the winter to early summer months. Reproduction times in the wading birds of third sub-group varies depending on their geographic location; those that are located geographically south within their range will generally breed in the fall and those that are located geographically north within their range will generally breed in the spring. The passerines, cuckoo, and wading birds in this sub-group typically build nests of varying shapes and materials within tree canopies, while the woodpecker and kingfisher species typically creates or uses existing cavities in trees. The breeding pairs in this sub-group can range from monogamous to polygamous and produce varying clutch sizes. Hatchlings in this sub-group are typically altricial and are typically reared by the adults until they are fledged and independent. However, wading bird hatchlings are typically subprecocial and mobile, able to leave the nest upon hatching. Adult wading birds will assist the young with feeding until they are independent. In general, nesting pairs share the responsibilities of building or creating a nest, protecting and incubating the eggs, and feeding and caring for the young.

The habitat needs of the forested wetland birds include mature trees for nesting and foraging and nearby bodies of water or perennially or intermittently flooded areas. These birds rely on water of good quality, particularly the wading birds that prey on fish, as water quality can affect the health of their prey populations.

Of the six forested wetland bird species, four are endangered and two are threatened. Critical habitat has been designated for three species.

The following representative threats have been synthesized from information available for several species:

- Loss, modification, and fragmentation of habitat due to dams, timber harvesting, urban development, agriculture, and other human development activities;
- Invasive plants and insects that affect the vegetation composition and food abundance;
- Human-caused or natural wildfires;
- Loss of suitable migration stop-over habitats;
- Avian diseases (avian malaria, avian pox) and parasitism;
- Predation at nesting sites from such predators as snakes, raptors, rats, and skunks;
- Changes (drought, temperature) in habitat influenced by climate change;
- Low genetic diversity and viability due to small, isolated populations;
- Environmental contaminants (pesticides, heavy metals, lead) that affect reproduction rates, loss of prey, or cause direct injury;
- Illegal hunting; and
- Collisions with manmade structures (such as radio and cell towers, wind turbines, or powerlines).

### 4.6.2 Nonforested Wetland Birds

Information on water and nonforested wetland birds has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, 2013) (U.S. Fish and Wildlife Service, 2014i) (U.S. Fish and Wildlife Service, 2011c) (U.S. Fish and Wildlife Service, 1998k) (U.S. Fish and Wildlife Service, 1996d) (U.S. Fish and Wildlife Service, 1999a) (U.S. Fish and Wildlife Service, Southeast Region, 2010).

Nonforested wetland birds include passerines (warbler, sparrow, and blackbird), a raptor (snail kite), and wading birds (crane, rail, and moorhen). Birds in this sub-group spend most of their time in nonforested wetland habitats, such as mudflats, salt marshes, inland freshwater marshes, and seasonally wet prairies. The passerine species in this sub-group forage in the grasses and reeds of the nonforested wetland habitat, primarily preying on terrestrial insects. The raptor species in this sub-group, a snail kite, is a molluscivore; primarily eating snails and other mollusks that it grabs out of the shallow wetlands waters with its feet before returning to a terrestrial perch to feed on its catch. Wading bird species in this sub-group have long legs and specially adapted feet that allow them to traverse the soft sediments of shallow water where they spend most of their time foraging on fish, amphibians, and aquatic invertebrates. Species in this sub-group often have specialized bills or feeding behaviors specific to feeding on their prey items. Some of the passerines and wading birds in this sub-group are communal and often forage and nest in flocks.

Reproduction times vary greatly between species in this sub-group. Species in this sub-group nest, either alone or in colonies, near the water's edge in tree canopies, in dead tree or stump cavities, or in marsh vegetation. Some of the passerine and wading bird species migrate north for the breeding season in response to temperature changes or precipitation patterns. The breeding pairs in this sub-group can range from monogamous to polygamous and produce varying clutch sizes. Hatchlings in this sub-group are typically altricial and are typically reared by the adults until they are fledged and independent. However, wading bird hatchlings are typically subprecocial and mobile, able to leave the nest upon hatching. Adult wading birds will assist the young with feeding until they are independent. In general, nesting pairs (the male and female) in this sub-group share the responsibilities of building or creating a nest, protecting and incubating the eggs, and feeding and caring for the young.

The habitat needs of the nonforested wetland birds include perennially or intermittently flooded areas and a habitat with dense herbaceous and marsh vegetation, such as reeds, for foraging and nesting. These species also require undisturbed areas for nesting, as disturbance can affect the health of eggs or chicks. Good water quality in these aquatic habitats is also important to support healthy populations of prey species.

All of the 15 nonforested wetland bird species are endangered. Critical habitat has been designated for five species.

The following representative threats to nonforested wetland birds have been synthesized from information available for several species:

- Loss of wetland and shallow water habitat to urban, agricultural, and industrial development, often in the form of filling or diking and draining of wetlands;
- Loss of flooded wetland habitat due to flood control and other hydrologic alterations;
- Human disturbance of nesting areas where excessive disturbance may cause the parents to desert the nest, exposing eggs or chicks to weather conditions and predators, and interrupting feeding may stress juvenile birds during critical periods in their development;

- Predation at nesting sites resulting from development near breeding areas that provides food attracting increased numbers of predators, such as raccoons, skunks, and foxes, and some predators that are non-native, such as the Burmese python and mongoose;
- Collisions with manmade objects, such as power lines and fences;
- Pollution of aquatic habitat from spills and runoff;
- Loss of genetic diversity resulting from historic overhunting;
- Extreme and adverse weather conditions (hurricanes, storms);
- Parasitism, particularly by other bird species such as the shiny cowbird; and
- Alteration of aquatic food webs due to overfishing and climate change.

### 4.6.3 Freshwater Birds

Information on freshwater birds has been synthesized from a several sources: (U.S. Fish and Wildlife Service, 2011c) (U.S. Fish and Wildlife Service, 2009b) (U.S. Fish and Wildlife Service, 2015f).

The freshwater birds include ducks and coots. These birds spend most of their time swimming, resting, and foraging in open freshwater streams, rivers, and lakes (including reservoirs) that may be part of a forested or nonforested wetland system, as well as in estuarine waters along coastlines. Ducks and coots have physical characteristics that allow them to spend long periods of time on the water, such as oily feathers for buoyancy and webbed or lobed feet for ease of swimming. These birds primarily prey on aquatic invertebrates, but may also feed on small fish and aquatic plants. They may forage on the water's surface or dive underwater for short periods. The coots are typically communal and will forage and nest in flocks. The ducks will sometimes feed and nest in groups, but are often alone or in pairs.

Reproduction typically occurs in the spring. The ducks are generally ground nesters, concealing their grass nests under herbaceous vegetation near the water or upland, while the coots typically create floating grass nests on the open water. Breeding pairs are typically monogamous and produce varying clutch sizes. Hatchlings are typically precocial and able to forage upon hatching. Adult freshwater birds will assist their young with foraging until they are independent. In general, eggs may be incubated and young cared for by the breeding pair (the male and female) or by just the female.

The freshwater birds reside in the Hawaiian Islands year-round. Although the Hawaiian coot migrates in response to precipitation patterns, migration is typically only between the islands of Hawaii.

These freshwater birds rely on good water quality, as they spend the majority of their time in aquatic environments. Water bodies with good water quality are also important to support healthy populations of the prey species. The freshwater birds require undisturbed areas and dense herbaceous vegetation near the water for nesting.

All three of the freshwater bird species are endangered. Critical habitat has not been designated for any of the species.

The following representative threats to freshwater birds have been synthesized from information available for several species:

- Loss of freshwater habitat to urban, agricultural, and industrial development, often in the form of filling or diking and draining of freshwater sources;

- Human disturbance of nesting areas, where excessive disturbance may cause the parents to desert the nest, exposing eggs or chicks to weather conditions and predators, and interrupting feeding may stress juvenile birds during critical periods in their development;
- Predation at nesting sites resulting from development near breeding areas that provides food attracting increased numbers of predators, such as the non-native mongoose, and domestic and feral cats and dogs pose a threat to species that nest on the ground;
- Collisions with manmade objects, such as power lines and fences;
- Pollution of aquatic habitat from spills and runoff;
- Hybridization with more common waterfowl species or inbreeding due to small population sizes; and
- Alteration of aquatic food webs due to overfishing and climate change.

### 4.6.4 Nearshore Marine Birds

Information on nearshore marine birds has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1990h) (Northeast Roseate Tern Recovery Team, 1998) (U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office, 2009) (U.S. Fish and Wildlife Service, Southeast Region and Northeast Region, 2010) (U.S. Fish and Wildlife Service, 2011f).

Nearshore marine birds, including the marbled murrelet, terns, and one species of eider, spend most of their time in shallow, nearshore marine waters, though they nest on beaches and in nearby terrestrial habitats. These birds forage in shallow ocean waters, concentrating in areas where fish are brought to the surface by predatory fish or the movement of the water. While marbled murrelets spend most of their time foraging in the nearshore marine environments, they tend to breed in old-growth forests located close to the shore. Steller's eiders often nest in vegetation in tundra habitats generally located near the ocean. Hatchlings of nearshore marine birds are typically semiprecocial or precocial and are usually mobile upon hatching. Adult nearshore marine birds will feed young or assist them with foraging until the young are able to feed themselves. The terns usually breed on small islands or barrier beaches, often in areas of dense vegetative cover, and migrate between wintering and breeding locations.

Physical characteristics of the nearshore marine birds include webbed feet for swimming or wading, efficient flight capability for long distance travel, and specialized bills for specific feeding habits. Nearshore marine birds feed almost exclusively on fish, although some species, such as the eider, also occasionally eats insect larvae and plants.

The habitat needs of nearshore marine birds include undisturbed shallow marine waters for foraging. Because these birds spend the majority of their time in the water, they rely on water free from pollution, which also supports healthy fish populations these birds require as a food source. Nearshore marine birds also rely on undisturbed terrestrial habitats near the ocean for breeding and nesting, with the murrelets requiring old-growth forests, terns requiring beaches, and the eider requiring tundra.

Of the five nearshore marine bird species, two are endangered, two are threatened, and one species has populations that are listed as endangered in some States and as threatened in others. Critical habitat has been designated for two species.

The following representative threats to nearshore marine birds have been synthesized from information available for several species:

- Incidental capture and death resulting from commercial fishing;

- Introduction of predators or other non-native animals, such as pigs, rats, and goats, to nesting areas;
- Destruction or modification of nesting and foraging areas resulting from coastal development, including dredging and sand and gravel extraction;
- Collision with manmade structures;
- The spread of invasive, non-native vegetation at nesting sites; and
- Inundation of nesting areas due to rising sea levels influenced by climate change.

### 4.6.5 Offshore Marine Birds

Information on offshore marine birds has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1983b) (U.S. Fish and Wildlife Service, 1996e) (U.S. Fish and Wildlife Service, 2008f) (U.S. Fish and Wildlife Service, Pacific Island, 2011) (U.S. Fish and Wildlife Service, Anchorage Fish and Wildlife Office, 2014).

Offshore marine birds rely on open ocean waters as their primary habitat. These pelagic birds include an albatross, eider, shearwater, and petrel that spend the majority of their lives far from shore in the open ocean, only coming to land to nest. The albatross nests on offshore islands in open areas with little to no vegetation. The shearwaters and petrel typically nest in areas of steep topography, with the shearwater preferring densely vegetated areas and the petrel preferring more sparsely vegetated areas. The eider nests in sedge or grass marshes near shorelines or in large river deltas and tundra habitats with numerous lakes. Hatchlings of offshore marine birds are typically semiprecocial or semialricial and are typically mobile shortly after hatching. Adult offshore marine birds will feed their young until they are fledged and independent.

Physical characteristics of this sub-group include webbed feet for swimming, efficient flight capability for long distance travel, and specialized bills for specific feeding habits. Offshore marine birds feed on fish, crustaceans, squid, and shrimp, though the albatrosses also feed on blubber, offal, and carcasses of marine mammals.

Because these birds spend the majority of their time in open ocean waters, they rely on good water quality, which also supports healthy populations of their prey. Petrels and shearwaters tend to rely on the corridors between the open ocean and their nesting habitats being free from obstructions and bright lights, as fledglings are often attracted to lights and may be thrown off the path.

Of the four offshore marine bird species, two are endangered and two are threatened. Critical habitat has been designated for one species.

The following representative threats to offshore marine birds have been synthesized from information available for several listed species:

- Incidental capture and death resulting from commercial fishing;
- Introduction of predators or other non-native animals, such as pigs, rats, and goats, to nesting areas;
- Destruction or modification of nesting and foraging areas resulting from coastal development, including dredging and sand and gravel extraction;
- Collision with manmade structures;
- The spread of invasive, non-native vegetation at nesting sites; and
- Inundation of nesting areas due to rising sea levels influenced by climate change.

### 4.6.6 Beach Birds

Information on beach birds has been synthesized from two sources: (U.S. Fish and Wildlife Service, 1996f) and (U.S. Fish and Wildlife Service, 2007e).

The two beach birds, western snowy plover and piping plover, rely on the beaches as their primary habitat. These birds nest above the high tide line on coastal beaches, sand flats, sparsely vegetated dunes, or beaches at the mouths of creeks and rivers. During the winter, western snowy plovers are found on mud flats and salt ponds and piping plovers are found at the end of barrier islands and along sandy peninsulas. These plovers tend to nest in areas with little or no vegetation, though driftwood, debris, and dune plants often provide cover for chicks. Hatchlings of beach birds are typically precocial – mobile and able to forage upon hatching. Adult beach birds will assist the young with foraging until they are independent.

Physical characteristics of beach birds include bills specialized to feed on aquatic and terrestrial invertebrates, such as marine worms, beetles, and crustaceans.

The habitat needs of these birds include undisturbed beach areas for breeding and nesting. These birds also rely on kelp and driftwood on the beaches for easy access to the invertebrate prey populations that congregate around these materials.

The western snowy plover is threatened and piping plover has populations listed as endangered in some States and as threatened in others. Critical habitat has been designated for both species.

The following representative threats to beach birds have been synthesized from information available for several species:

- Introduction of predators or other non-native animals, such as pigs, rats, and goats, to nesting areas;
- Destruction or modification of nesting and foraging areas resulting from coastal development, including dredging and sand and gravel extraction;
- The spread of invasive, non-native vegetation at nesting sites; and
- Inundation of nesting areas due to rising sea levels influenced by climate change.

### 4.6.7 Rangeland Birds

Information on rangeland birds has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1984j) (U.S. Fish and Wildlife Service, 1990i) (U.S. Fish and Wildlife Service, 1992b) (U.S. Fish and Wildlife Service, 1996g) (U.S. Fish and Wildlife Service, 1998m) (U.S. Fish and Wildlife Service, 2008d) (U.S. Fish and Wildlife Service, Pacific Island, 2008), (U.S. Fish and Wildlife Service, 2013h) (U.S. Fish and Wildlife Service, 2014h) (U.S. Fish and Wildlife Service, Buenos Aires National, 2014) (U.S. Fish and Wildlife Service, Pacific Island, 2014d) (U.S. Fish and Wildlife Service, 2014q) (U.S. Fish and Wildlife Service, 2015j).

Rangeland birds, including birds of prey, passerines, shrub-nesting birds, and ground-nesting birds, are those species that rely on open upland habitats dominated by grasses, shrubs, and herbaceous growth that lack trees; these habitats include the herbaceous, shrub and brush, and mixed rangeland habitat types. The shrub-nesting species (including towhees and loggerhead shrikes) and ground-nesting species (including larks, prairie-chickens, and bobwhites) are often cryptically colored, and spend a large amount of time on the ground, rather than in flight or perching. Others, particularly the birds of prey such as condors and falcons, are soaring birds that spend most of the time flying in search of food. The rangeland sub-group also includes passerines, such as the finches, which typically have a small to medium body size, are relatively vocal, have relatively bright colors or distinct markings, and feet specially adapted to perching.

The Mariana grey swiftlets also nest in limestone caves, though they prefer to forage in open grassland where they can catch small insects while in flight.

The physical and behavioral adaptations of the rangeland birds allow them to capitalize on the unique elements within the open habitats they inhabit. The shrub and ground-nesting species typically exhibit an omnivorous diet that consists of a variety of seeds, grasses, buds, catkins, and insects. The falcons eat small birds, insects, rodents, and reptiles, while condors are opportunistic scavengers, feeding on dead animals (Wildlife Habitat Management Institute and Wildlife Habitat Council, 1999) (Pima County Government, 2002).

The females of ground-nesting rangeland species will typically excavate a shallow depression within the grassland soil that has enough vegetative concealment to disguise the nest from predators. The scrub-nesting rangeland species create nests within the crowns of shrubs using various materials. Others, including the birds of prey, tend to nest in the few, sparse trees or inaccessible barren areas like rocky cliffs. Breeding pairs are either monogamous or polygamous. The young of most ground-nesting birds are precocial (born covered with down and with open eyes, active and able to feed themselves almost immediately) and leave the nest soon after hatching. The young of birds of prey and passerines are altricial (born with little down and with eyes closed, unable to move or feed themselves without help), and require care from the parent(s) to survive (Texas Parks and Wildlife Department, Undated) (Wildlife Habitat Management Institute and Wildlife Habitat Council, 1999) (U.S. Fish and Wildlife Service, 2012f) (Kauffman, 2014) (Hunt, 2014).

The habitat needs of the rangeland birds tend to vary among the species. Several small, ground-dwelling birds require areas of bare ground for unrestricted movement. However, these birds also rely on some low, sparse vegetation for cover and protection from predators. Several birds, such as the falcons, require open terrain for searching for prey and a few trees for nesting.

Of the 21 rangeland bird species, 13 are endangered, 7 are threatened, and 1 is proposed threatened. Critical habitat has been designated for four listed species and proposed for one species.

The following representative threats to this rangeland birds have been synthesized from information available for several species:

- Loss and fragmentation of habitat due to agriculture, urban development, and other human development activities;
- Alteration of vegetation composition and food abundance due to grazing activities and invasive grasses and plants;
- Human-caused or natural wildfires;
- Hydrologic management efforts creating a wetter, and sometimes flooded, area in nesting locations;
- Predation at nesting sites from such predators as snakes, raptors, coyotes, and raccoons;
- Avian diseases (avian malaria, avian cholera) and parasitism, including brood infiltration by cowbirds;
- Collisions with manmade structures (such as radio and cell towers, wind turbines, or powerlines);
- Changes to habitat from extreme weather events and changes in rainfall patterns that may be influenced by climate change;
- Illegal hunting; and

- Low genetic diversity due to small, isolated populations.

### 4.6.8 Forest Land Birds

Information on forest land birds has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, Pacific Island, 2009) (U.S. Fish and Wildlife Service, 2009a) (U.S. Fish and Wildlife Service, East Lansing Field Office, 2012) (U.S. Fish and Wildlife Service, Pacific Island, 2014c) (U.S. Fish and Wildlife Service, 2011d) (U.S. Fish and Wildlife Service, 2013j) (U.S. Fish and Wildlife Service, 1982b) (U.S. Fish and Wildlife Service, 1984i).

The members of this sub-group are defined by their dependence on upland forested areas for breeding, nesting, and foraging habitat. These forest lands may be dominated by deciduous or evergreen (coniferous or broad-leaved) trees, or a combination of both. This sub-group consists of raptor, parrot, crow, pigeon, nightjar, and passerine (honeycreepers, thrushes, warblers, white-eyes) species. Species in this sub-group typically rely on trees for food, nesting, and shelter. This sub-group is very diverse in terms of feeding strategies and includes birds that eat fruit (frugivores), flower nectar (nectarivorous), insects (insectivores), grains and seeds (granivores), other animals (carnivores), or a combination of those food types. The nightjar species and some of the raptor species (owls) are generally nocturnal; they forage and hunt for their prey at night.

The raptor, some passerine, crow, pigeon, and honeycreeper species tend to nest on tree branches, while parrot species tend to nest in tree cavities and nightjar and some passerine species tend to nest on the forest floor. Species can be monogamous or polygamous and produce varying clutch sizes. Hatchlings of most forest land species are altricial and are reared by the adults until they are fledged and independent.

Some of the passerine and parrot species migrate north within their range during breeding season and south within their range for wintering. While migrating, these species may utilize stopover sites to feed and rest before reaching their final breeding or wintering destination. Migrating species may travel in groups or alone.

The habitat needs of the forest land birds include mature deciduous or evergreen trees, as most of these species nest on branches or in tree cavities. The forest litter present in this habitat also provides cover for several species and supports the prey species of the carnivores.

Of the 36 forest land bird species, 34 are endangered and 2 are threatened. Critical habitat has been designated for eight species.

The following representative threats to forest land birds have been synthesized from information available for several species:

- Loss, modification, and fragmentation of habitat due to dams, timber harvesting, urban development, agriculture, and other human development activities;
- Invasive plants and insects that affect the vegetation composition and food abundance;
- Wildfires, either manmade or natural;
- Loss of suitable migration stop-over habitats;
- Avian diseases (avian malaria, avian pox) and parasitism;
- Predation at nesting sites by snakes, raptors, rats, and skunks;
- Changes (drought, temperature) in habitat that may be influenced by climate change;
- Low genetic diversity and viability due to small, isolated populations;

- Environmental contaminants (pesticides, heavy metals, lead) that affect reproduction rates, loss of prey, or cause direct injury;
- Illegal hunting; and
- Collisions with manmade structures (such as radio and cell towers, wind turbines, or powerlines).

Table 4-4 lists all U.S. birds, by sub-group, which are listed or proposed threatened or endangered, the State(s) in which they are found, and whether critical habitat has been designated for the species.

**Table 4-4: Threatened and Endangered Birds in the U.S.**

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Forested Wetland Birds – Occur in the Action Area | | | | |
| Ivory-billed woodpecker | *Campephilus principalis* | E | AR | No |
| Yellow-billed cuckoo, Western U.S. DPS | *Coccyzus americanus* | T | AZ, CA, CO, MT, NM, NV, OR, TX, UT, WA, WY | No |
| Southwestern willow flycatcher | *Empidonax traillii extimus* | E | AZ, CA, CO, NM, NV, TX, UT | Yes |
| Guam Micronesian kingfisher | *Halcyon cinnamomina* | E | GU | Yes |
| Wood stork | *Mycteria americana* | T | AL, FL, GA, MS, NC, SC | No |
| Least Bell's vireo | *Vireo bellii pusillus* | E | CA | Yes |
| Nonforested Wetland Birds – Occur in the Action Area | | | | |
| Nightingale reed warbler (old world warbler) | *Acrocephalus luscinia* | E | GU, NMI | No |
| Yellow-shouldered blackbird | *Agelaius xanthomus* | E | PR | Yes |
| Cape Sable seaside sparrow | *Ammodramus maritimus mirabilis* | E | FL | Yes |
| Mariana common moorhen | *Gallinula chloropus guami* | E | GU, NMI; West Pacific Ocean U.S. (GU, NMI) | No |
| Hawaiian common moorhen | *Gallinula chloropus sandvicensis* | E | HI | No |
| Whooping crane | *Grus americana* | E | CO, KS, MT, ND, NE, OK, SD, TX; Ex.Pop. WI, FL | Yes |
| Mississippi sandhill crane | *Grus canadensis pulla* | E | MS | Yes |
| Hawaiian stilt | *Himantopus mexicanus knudseni* | E | HI | No |
| Eskimo curlew | *Numenius borealis* | E | AK, NE, OK, TX | No |
| California clapper rail | *Rallus longirostris obsoletus* | E | CA | No |
| Guam rail | *Rallus owstoni* | E | GU | No |
| Light-footed clapper rail | *Rallus longirostris levipes* | E | CA | No |
| Yuma clapper rail | *Rallus longirostris yumanensis* | E | AZ, CA, NV | No |
| Everglade snail kite | *Rostrhamus sociabilis plumbeus* | E | FL | Yes |
| Bachman's warbler (=wood) | *Vermivora bachmanii* | E | FL, SC | No |
| Freshwater Birds—Occur in the Action Area | | | | |
| Laysan duck | *Anas laysanensis* | E | HI | No |
| Hawaiian (=koloa) Duck | *Anas wyvilliana* | E | HI | No |
| Hawaiian coot | *Fulica americana alai* | E | HI | No |
| Nearshore Marine Birds – Occur in the Action Area | | | | |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Marbled murrelet | *Brachyramphus marmoratus* | T | CA, OR, WA | Yes |
| Steller's Eider | *Polysticta stelleri* | T | AK | Yes |
| California least tern | *Sterna antillarum browni* | E | AZ, CA | No |
| Least tern | *Sterna antillarum* | E | AR, CO, IA, IL, IN, KS, KY, LA, MO, MS, MT, ND, NE, NM, OK, SD, TN, TX | No |
| Roseate tern | *Sterna dougallii* | E | CT, MA, ME, NC, NH, NJ, NY, RI, VA | No |
| | | T | FL, NC, PR, SC, VI | No |
| Offshore Marine Birds – Although offshore marine waters do not occur in the Action Area, the spectacled eider nests in nonforested wetlands (sedge or grass marshes near shorelines) and the short-tailed albatross nests on beaches, both of which do. | | | | |
| Short-tailed albatross | *Phoebastria (=Diomedea) albatrus* | E | AK, CA, HI, OR, WA | No |
| Hawaiian dark-rumped petrel | *Pterodroma phaeopygia sandwichensis* | E | HI | No |
| Newell's Townsend's shearwater | *Puffinus auricularis newelli* | T | AS, HI | No |
| Spectacled eider | *Somateria fischeri* | T | AK | Yes |
| Beach Birds – Occur in the Action Area because beaches overlap with SFHAs. | | | | |
| Western snowy plover | *Charadrius alexandrinus nivosus* | T | CA, OR, WA | Yes |
| Piping Plover, Great Lakes | *Charadrius melodus* | E | IL, IN, MI, MN, MS, NY, OH, PA, WI | Yes |
| Piping plover | | T | AL, AR, CO, CT, DE, FL, GA, IA, KS, LA, MA, MD, ME, MN, MT, NC, ND, NE, NH, NJ, NM, NY, OK, RI, SC, SD, TX, VA, PR, VI | Yes |
| Rangeland Birds – Occur in the Action Area | | | | |
| Nihoa millerbird (old world warbler) | *Acrocephalus familiaris kingi* | E | HI | No |
| Mariana gray swiftlet | *Aerodramus vanikorensis bartschi* | E | GU, NMI | No |
| Florida grasshopper sparrow | *Ammodramus savannarum floridanus* | E | FL | No |
| San Clemente sage sparrow | *Amphispiza belli clementeae* | T | CA | No |
| Florida scrub-jay | *Aphelocoma coerulescens* | T | FL | No |
| Hawaiian goose | *Branta (=Nesochen) sandvicensis* | E | HI | No |
| Greater sage-grouse | *Centrocercus urophasianus* | PT in CA/NV Region | CT, NV, WA, CO, ID, MT, ND, OR, SD, UT, WY | Proposed |
| Masked bobwhite (quail) | *Colinus virginianus ridgwayi* | E | AZ | No |
| Golden-cheeked warbler (=wood) | *Dendroica chrysoparia* | E | TX | No |
| Streaked Horned lark | *Eremophila alpestris strigata* | T | OR, WA | Yes |
| Northern aplomado falcon | *Falco femoralis septentrionalis* | E | TX, NM, AZ | No |
| California condor | *Gymnogyps californianus* | E | OR, CA, AZ | Yes |
| San Clemente loggerhead shrike | *Lanius ludovicianus mearnsi* | E | CA | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Inyo California towhee | *Pipilo crissalis eremophilus* | T | CA | Yes |
| Coastal California gnatcatcher | *Polioptila californica* | T | CA | Yes |
| Audubon's crested caracara | *Polyborus plancus audubonii* | T | TX, NM, LA, FL, AZ | No |
| Laysan finch (honeycreeper) | *Telespyza cantans* | E | HI | No |
| Nihoa finch (honeycreeper) | *Telespyza ultima* | E | HI | No |
| Attwater's greater prairie-chicken | *Tympanuchus cupido attwateri* | E | TX | No |
| Lesser prairie-chicken | *Tympanuchus pallidicinctus* | T | CO, KS, NM, OK, TX | No |
| Black-capped Vireo | *Vireo atricapilla* | E | OK, TX | No |
| Forest Land Birds – Occur in the Action Area | | | | |
| Puerto Rican sharp-shinned hawk | *Accipiter striatus venator* | E | PR | No |
| Puerto Rican parrot | *Amazona vittata* | E | PR | No |
| Puerto Rican broad-winged hawk | *Buteo platypterus brunnescens* | E | PR | No |
| Hawaiian (='Io) Hawk | *Buteo solitarius* | E | HI | No |
| Puerto Rican nightjar | *Caprimulgus noctitherus* | E | PR | No |
| Oahu Elepaio | *Chasiempis sandwichensis ibidis* | E | HI | Yes |
| Puerto Rican plain Pigeon | *Columba inornata wetmorei* | E | PR | No |
| Hawaiian (='alala) Crow | *Corvus hawaiiensis* | E | HI | No |
| Mariana (=aga) Crow | *Corvus kubaryi* | E | GU, NMI | Yes |
| White-necked crow | *Corvus leucognaphalus* | E | PR | No |
| Nukupu`u (honeycreeper) | *Hemignathus lucidus* | E | HI | No |
| Akiapola`au (honeycreeper) | *Hemignathus munroi* | E | HI | No |
| Kauai akialoa (honeycreeper) | *Hemignathus procerus* | E | HI | No |
| Palila (honeycreeper) | *Loxioides bailleui* | E | HI | Yes |
| Akekee | *Loxops caeruleirostris* | E | HI | Yes |
| Hawaii akepa (honeycreeper) | *Loxops coccineus* | E | HI | No |
| Maui akepa (honeycreeper) | *Loxops coccineus ochraceus* | E | HI | No |
| Micronesian megapode | *Megapodius laperouse* | E | GU, NMI, PW | No |
| Po`ouli (honeycreeper) | *Melamprosops phaeosoma* | E | HI | No |
| Kauai `o`o (honeyeater) | *Moho braccatus* | E | HI | No |
| Large Kauai (=kamao) Thrush | *Myadestes myadestinus* | E | HI | No |
| Molokai thrush | *Myadestes lanaiensis rutha* | E | HI | No |
| Small Kauai (=puaiohi) Thrush | *Myadestes palmeri* | E | HI | No |
| Akikiki | *Oreomystis bairdi* | E | HI | Yes |
| Hawaii creeper | *Oreomystis mana* | E | HI | No |
| Crested honeycreeper | *Palmeria dolei* | E | HI | No |
| Molokai creeper | *Paroreomyza flammea* | E | HI | No |
| Oahu creeper | *Paroreomyza maculata* | E | HI | No |
| `O`u (honeycreeper) | *Psittirostra psittacea* | E | HI | No |
| Maui parrotbill (honeycreeper) | *Pseudonestor xanthophrys* | E | HI | No |
| Thick-billed parrot | *Rhynchopsitta pachyrhyncha* | E | NM, AZ | No |
| Kirtland's Warbler | *Setophaga kirtlandii (= Dendroica kirtlandii)* | E | FL, MI, SC, WI | No |
| Mexican spotted owl | *Strix occidentalis lucida* | T | AZ, CO, NM, TX, UT | Yes |
| Northern spotted owl | *Strix occidentalis caurina* | T | CA, OR, WA | Yes |
| Bridled white-eye | *Zosterops conspicillatus* | E | GU | No |
| Rota bridled White-eye | *Zosterops rotensis* | E | NMI | Yes |
| Source: (U.S. Fish and Wildlife Service, 2014m)<br>E = Endangered; T = Threatened; PE = Proposed Endangered; PT = Proposed Threatened | | | | |

## 4.7 Reptiles

Reptiles are any cold-blooded vertebrate of the class Reptilia, comprised of turtles, snakes, lizards, crocodilians, and amphisbaenians (worm lizards). Key features that separate this group

from amphibians are the presence of scales and the dependence of all life stages on breathing air.

This species group has five sub-groups: wetland reptiles, offshore marine reptiles, inland sandy areas reptiles, rangeland reptiles, and evergreen forest reptiles. All species are under the jurisdiction of USFWS, except for offshore marine reptiles (sea turtles), which are regulated by NMFS.

### 4.7.1 Wetland Reptiles

Information on wetland reptiles has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, Endangered Species Program, 1985) (U.S. Fish and Wildlife Service, Southeast Region, 1990) (U.S. Fish and Wildlife Service, Southeast Region, 1993) (U.S. Fish and Wildlife Service, Southeast Region, 1999b) (U.S. Fish and Wildlife Service, Pennsylvania Field Office, 2001) (U.S. Fish and Wildlife Service, Midwest Region, 2008) (U.S. Fish and Wildlife Service, Southeast Region, 1999a).

Wetland reptiles include turtles, crocodiles, and snakes that rely on forested or nonforested wetlands. These reptiles occupy habitats with characteristics such as slow-moving water, wet soils, grassy, herbaceous vegetation, and canopy cover. The wetland reptiles typically spend the majority of their time basking, either in or out of water, and are generally active during the day, although some, including certain species of snakes, become crepuscular (active in twilight) in the height of summer. Wetland reptiles forage both on land and in the water and are primarily carnivorous and opportunistic, eating small mammals, invertebrates, fish, amphibians, crustaceans, and birds. Freshwater turtles are typically omnivorous, with a diet consisting of plant material, seeds, and algae, as well as fish, insects, and other invertebrates.

In the winter months, some of the wetland reptiles will burrow into soft mud or a plant's roots or use an existing abandoned burrow to brummate. Certain species, including several turtles, hibernate in dense patches of vegetation. While breeding and reproduction typically occur in the spring, snakes also may breed in the fall and turtles may breed in the summer. Egg-laying reptiles, including the crocodiles and turtles, will generally lay eggs on the ground in the sand or vegetation at the water's edge. The crocodiles nest on the shorelines or banks of swamps and creeks. Non-egg-layers, such as the garter snakes, are ovoviviparous. Hatchlings and young generally receive little to no parental care.

The habitat needs of the wetland reptiles include availability of water and wetland vegetation for cover. Because these reptiles spend much of their time in water, water quality is an important factor in the health of their habitats and they are affected by siltation and accumulations of chemicals. These wetland reptiles also tend to rely on the presence of both water and terrestrial environments, requiring the diversity for basking, food, shelter, and more.

Of the 13 wetland reptiles, 3 are endangered and 10 are threatened. Critical habitat has been designated for one species.

The following representative threats to wetland reptiles have been synthesized from information available for several species:

- Loss and modification of habitat from urban development, agriculture, drainage projects, dams, reservoirs, and other human development activities;
- Contaminant run-off, such as fertilizer, road salt, septic, and motor vehicle pollutants, traveling into aquatic systems and degrading the water quality, causing direct injury, and causing a loss of prey;
- Recreation (such as camping, fishing, or boating) disturbing nesting and breeding;

- Increases in motor vehicle traffic and road densities cause road mortalities;
- Extreme and adverse weather conditions (hurricanes, drought), which may be influenced by climate change;
- Illegal collection and trade; and
- Predation of adults and of young and eggs at nesting sites by raptors, raccoons, herons, and foxes. Nearby human development can provide food and water for predators, increasing their abundance.

### 4.7.2 Offshore Marine Reptiles

Information on offshore marine reptiles has been synthesized from a variety of sources: (National Marine Fisheries Service, Office of Protected Resources, and U.S. Fish and Wildlife Service, Southeast Region, 2007b) (National Marine Fisheries Service, Office of Protected Resources, and U.S. Fish and Wildlife Service, Southeast Region, 2007a) (National Marine Fisheries Service, U.S. Fish and Wildlife Service, and SEMARNAT, 2011) (National Marine Fisheries Service, Office of Protected Resources, and U.S. Fish and Wildlife Service, Southeast Region, 2013) (U.S. Fish and Wildlife Service, 2014g).

Offshore marine reptiles consist exclusively of sea turtles. Sea turtles spend the majority of their lives in the marine environment, resting and foraging near the water's surface within marine grasses or algae or in rocks and coral at the ocean bottom. All sea turtles are carnivores or omnivores, except for adult green sea turtles, which are primarily herbivores. Sea turtles typically feed on sponges, crustaceans, marine grasses and algae (notably Sargassum), and jellyfish.

Sea turtles generally remain solitary except when mating. Male sea turtles often spend their entire lives in the marine environment; female sea turtles will leave the marine environment only briefly to lay their eggs in the sand of the beaches where they hatched. Female sea turtles usually come ashore at night and use their flippers to dig a nest in the sand. After laying their soft-shelled eggs, the females cover up the nest with sand and retreat to the water; the females do not return to the nest. After an incubation period, hatchling sea turtles generally emerge from their nests at night and make their way immediately to the ocean. Both hatchling and adult sea turtles migrate, sometimes significant distances, between nesting and foraging grounds and between summer and wintering waters.

The habitat needs of offshore marine reptiles include adequate, undisturbed nesting habitats with a lack of artificial lighting. These sea turtles also depend on good water quality, as they spend the majority of their time in the water, and can be adversely affected by the presence of pollutants and trash.

Of the six sea turtles, two are listed or proposed as endangered (in one State each) and threatened (in multiple States each); critical habitat has been designated for the populations listed or proposed as threatened. Of the remaining four species, three are listed or proposed as endangered and one is threatened; critical habitat has been designated for two species.

The following representative threats to sea turtles have been synthesized from information available for several species:

- Loss and modification of nesting habitat from urban development, beach armoring, dredging, and other human development activities;
- Disorientation of hatchlings or adults from artificial lighting near nesting areas;
- Contamination of the marine environment by such pollutants as herbicides, pesticides, heavy metals, oil spills, and trash or waste;

- Illegal hunting and collection and trade of eggs and tortoiseshells;
- Disease, namely Fibropapillomatosis, which is believed to be caused by a virus (Jones A. G., 2004);
- Predators at nesting sites, such as feral pigs, lizards, birds, and raccoons; and
- Changes (temperature, sea levels, prey distribution) in habitat influenced by climate change.

### 4.7.3 Inland Sandy Areas Reptiles

Information on inland sandy areas reptiles has been synthesized from various sources: (U.S. Fish and Wildlife Service, 1984a) (U.S. Fish and Wildlife Service, Southeast Region, 2007).

Inland sandy areas reptiles are lizards that occupy arid desert dunes (a fringe-toed lizard) or mesic areas with well-drained sandy soils (two skinks). These reptiles are most often active in early mornings and late afternoons. To escape the mid-afternoon heat, these lizards may spend the majority of the day burrowed beneath the sand or in the shade of vegetation. The lizards are able to dive into sand and "swim" through it to avoid predators. The inland sandy area reptiles are primarily insectivorous. Although vegetation is generally scarce in their preferred habitats, these reptiles will sometimes feed on plant matter.

The lizards tend to breed in the spring after emerging from winter dormancy, with the breeding season extending from late April to mid-August or between February and May. Nests are typically made under the sand and hatchlings receive little to no parental care.

The habitat needs of inland sandy areas reptiles include sandy deposits for cover and rainfall for desert vegetation growth, which is important for attracting insect populations used as prey. These reptiles also prefer undisturbed areas, as low-compacted soils are easier to burrow into, and habitats with low soil moisture and temperature.

All three inland sandy area reptiles are threatened. Critical habitat has been designated for one species.

The following representative threats to inland sandy areas reptiles have been synthesized from information available for several species:

- Loss or modification of habitat from urban development, grazing, agriculture, and other human development activities;
- Invasive plants changing the composition of the habitat and food abundance;
- Predation by raptors, coyotes, foxes, and snakes. Nearby human development can provide food and water for predators, increasing their abundance;
- Changes (rainfall amounts, temperature) in habitat due to climate change; and
- Low genetic diversity and viability due to small population size.

### 4.7.4 Rangeland Reptiles

Information on rangeland reptiles has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1982a) (U.S. Fish and Wildlife Service, 1985a) (U.S. Fish and Wildlife Service, 1986a) (U.S. Fish and Wildlife Service, 1990b) (U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, 2010c) (U.S. Fish and Wildlife Service, Pacific Southwest Region, 2011) (U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, 2011).

Rangeland reptiles include snakes, lizards, tortoises, and geckos that inhabit herbaceous, shrub and brush, and mixed rangeland habitats. These reptiles occupy arid habitats that contain patches of herbaceous or woody vegetation. When not foraging or breeding, these reptiles will typically spend their time in burrows, rock outcrops, or in the shade of vegetation. The tortoises in this sub-group are primarily herbivorous, foraging on grasses and the fruit on woody shrubs and cacti. Snake species are generally carnivorous, preying on small mammals, lizards, and small birds. The lizard and gecko species in this sub-group are typically opportunistic omnivores, feeding on plant matter and insects.

Rangeland reptiles are generally solitary except when mating. Egg-laying reptiles, including tortoises and lizards, typically lay their eggs in burrows, underneath the soil surface, or on rock outcrops. Non-egg-layers, such as the rattlesnakes, are ovoviviparous, retaining eggs inside their body until the eggs are ready to hatch and then giving birth to live young. Hatchlings in this sub-group generally receive little to no parental care. Some rangeland reptiles, such as the tortoises, will brummate (enter into a hibernation-type state of dormancy) in underground burrows.

The habitat needs of rangeland mammals include herbaceous vegetation and small rock crevices for protection from predators. Several species, including snakes, tortoises, and geckos, require plenty of sunlight for warmth.

Of the seven rangeland reptile species, two are endangered and five are threatened. Critical habitat has been designated for four species.

The following representative threats to rangeland reptiles have been synthesized from information available for several species:

- Loss or modification of habitat from urban development, grazing, agriculture, oil and gas exploration, and other human development activities;
- Illegal collection and trade;
- Human-caused or natural wildfires;
- Mortalities from motor vehicles, including ORVs;
- Invasive plants changing the composition of the habitat and food abundance;
- Predation by raptors, coyotes, foxes, feral cats, and snakes. Nearby development can provide food and water sources for predators, increasing their abundance;
- Changes (rainfall amounts, temperature) in habitat influenced by climate change; and
- Low genetic diversity and viability due to small population size.

### 4.7.5 Evergreen Forest Reptiles

Information on evergreen forest reptiles has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, Region 4, 1983) (U.S. Fish and Wildlife Service, 1984b) (U.S. Fish and Wildlife Service, 1984c) (U.S. Fish and Wildlife Service, 1984k) (U.S. Fish and Wildlife Service, 1986b) (U.S. Fish and Wildlife Service, Southeast Region, 2009a) (U.S. Fish and Wildlife Service, Southeast Region, 2014) (U.S. Fish and Wildlife Service, 2015g) (U.S. Fish and Wildlife Service, 2015l).

Reptiles in this sub-group are a pine snake, three boas, and three lizards (an ameiva, an anole, and an iguana) that occupy forested habitats with significant amounts of canopy cover and leaf litter. These reptiles primarily forage, rest, and bask on the ground or in trees, but two of the lizards live mainly on the ground. The boas and the lizards prefer sub-tropical broad-leaved evergreen forests; the black pine snake occupies temperate coniferous evergreen forests.

The majority of the evergreen forest reptiles are opportunistic predatory feeders, having a diet consisting of small prey such as lizards, insects, bats, amphibians, and rodents. Several of the lizard species also eat amphipods. Some evergreen forest lizard species are omnivorous, and eat fruit, plant matter, and insects. Egg-laying evergreen forest reptiles, such as several of the lizard species, lay their eggs on the ground in leaf litter, soil, or vegetation. Non-egg-layers in this sub-group, including several boa species, are ovoviviparous. Young of all species generally receive little to no parental care.

The habitat needs of evergreen forest reptiles include trees that provide canopy cover and shelter. However, these species also need gaps in the canopy to bask in the sun, which helps to raise their body temperatures.

Of the seven evergreen forest reptile species, four are endangered, two are threatened, and one is proposed threatened. Critical habitat has been designated for four listed species.

The following representative threats have been synthesized from information available for several species:

- Loss and modification of habitat from urban development, agriculture, grazing, deforestation, and other human development activities;
- Human recreational activities disturbing nesting and breeding;
- Illegal collection and trade;
- Predation of young and eggs at nesting sites by introduced predators, such as feral pigs, cats, and mongoose;
- Extreme and adverse weather conditions (hurricanes, storms);
- Human-caused or natural wildfires; and
- Invasive plants changing the composition and quality of habitat.

Table 4-5 lists all U.S. reptiles, by sub-group, which are listed or proposed threatened or endangered, the State(s) in which they are found, and whether critical habitat has been designated for the species.

**Table 4-5: Threatened and Endangered Reptiles in the U.S.**

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Wetland Reptiles – Occur in the Action Area | | | | |
| Bog (=Muhlenberg) turtle | *Clemmys muhlenbergii* | T | CT, DE, MA, MD, NJ, NY, PA, VA, TN, SC, NC, GA | No |
| American crocodile | *Crocodylus acutus* | T | FL | No |
| Ringed map turtle | *Graptemys oculifera* | T | LA, MS | No |
| Yellow-blotched map turtle | *Graptemys flavimaculata* | T | MS | No |
| Atlantic salt marsh snake | *Nerodia clarkii taeniata* | T | FL | No |
| Copperbelly water snake | *Nerodia erythrogaster neglecta* | T | IN, MI, OH, KY, IL | No |
| Alabama red-belly turtle | *Pseudemys alabamensis* | E | AL, MS | No |
| Plymouth red-bellied turtle | *Pseudemys rubriventris bangsi* | E | MA | Yes |
| Flattened musk turtle | *Sternotherus depressus* | T | AL | No |
| Northern Mexican gartersnake | *Thamnophis eques megalops* | T | AZ, NM | No |
| Giant garter snake | *Thamnophis gigas* | T | CA | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Narrow-headed garter snake | *Thamnophis rufipunctatus* | T | AZ, NM | No |
| San Francisco garter snake | *Thamnophis sirtalis tetrataenia* | E | CA | No |
| Offshore Marine Reptiles – Offshore marine reptiles occur in the Action Area because, although offshore marine waters do not occur in the Action Area, sea turtles nest on beaches, which do | | | | |
| Green sea turtle, North Atlantic DPS | *Chelonia mydas* | PT | AL, CT, DE, GA, LA, MA, MD, ME, MS, NC, NH, NJ, NY, PR, RI, SC, TX, VA, VI, | Yes |
| Green sea turtle, East Pacific DPS | | PT | CA | No |
| Green sea turtle, Central North Pacific DPS | | PT | HI | No |
| Green sea turtle, Central South Pacific DPS | | PE | AS, PW, | No |
| Green sea turtle, Central West Pacific | | PE | GU, FM, MH, NMI | No |
| Loggerhead sea turtle, Northwest Atlantic DPS | *Caretta caretta* | T | AL, FL, GA, LA, MS, NC, SC, TX, VA | Yes |
| Loggerhead sea turtle, North Pacific DPS | | E | OR | No |
| Leatherback sea turtle | *Dermochelys coriacea* | E | AK, AL, CA, CT, DE, FL, GA, HI, LA, MA, MD, ME, MS, NC, NH, NJ, NY, OR, PR, RI, SC, TX, VA, VI, WA | Yes |
| Hawksbill sea turtle | *Eretmochelys imbricata* | E | AL, AS, CT, DE, FL, GA, GU, HI, LA, MA, MD, ME, MS, NC, NH, NMI, NJ, NY, PR, PW, RI, SC, TX, VA, VI | Yes |
| Kemp's ridley sea turtle | *Lepidochelys kempii* | E | AL, CT, DE, FL, GA, LA, MA, MD, MS, NC, NJ, NY, RI, SC, TX, VA | No |
| Olive ridley sea turtle | *Lepidochelys olivacea* | T | CA, HI, OR | No |
| Inland Sandy Areas Reptiles – Occur in the Action Area | | | | |
| Bluetail mole skink | *Eumeces egregius lividus* | T | FL | No |
| Sand skink | *Neoseps reynoldsi* | T | FL | No |
| Coachella Valley fringe-toed lizard | *Uma inornata* | T | CA | Yes |
| Rangeland Reptiles – Occur in the Action Area | | | | |
| New Mexican ridge-nosed rattlesnake | *Crotalus willardi obscurus* | T | AZ, NM | Yes |
| Eastern indigo snake | *Drymarchon corais couperi* | T | AL, FL, GA, SC, MS | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Blunt-nosed leopard lizard | *Gambelia silus* | E | CA | No |
| Desert tortoise | *Gopherus agassizii* | T | AZ, CA, NV, UT | Yes |
| Gopher tortoise | *Gopherus polyphemus* | T | AL, LA, MS, SC, GA, FL | No |
| Alameda whipsnake (=striped racer) | *Masticophis lateralis euryxanthus* | T | CA | Yes |
| Monito gecko | *Sphaerodactylus micropithecus* | E | PR | Yes |
| Evergreen Forest Reptiles – Occur in the Action Area | | | | |
| St. Croix ground lizard | *Ameiva polops* | E | VI | Yes |
| Culebra Island giant anole | *Anolis roosevelti* | E | PR, VI | Yes |
| Mona ground Iguana | *Cyclura stejnegeri* | T | PR | Yes |
| Puerto Rican boa | *Epicrates inornatus* | E | PR | No |
| Virgin Islands tree boa | *Epicrates monensis granti* | E | PR, VI | No |
| Mona boa | *Epicrates monensis* | T | PR | Yes |
| Black pine snake | *Pituophis melanoleucus lodingi* | PT | AL, MS | No |
| Source: (U.S. Fish and Wildlife Service, 2014m)<br>E = Endangered; T = Threatened; PE = Proposed Endangered; PT = Proposed Threatened | | | | |

## 4.8 Amphibians

Amphibians are cold-blooded vertebrates of the class Amphibia, comprising frogs, toads, newts, and salamanders. The four sub-groups of amphibians are wetland amphibians, freshwater amphibians, cave amphibians, and forest land amphibians. All threatened and endangered amphibians are under the jurisdiction of USFWS.

### 4.8.1 Wetland Amphibians

Information on wetland amphibians has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1999e) (U.S. Fish and Wildlife Service, 1999d) (U.S. Fish and Wildlife Service, 2013f) (U.S. Fish and Wildlife Service, 2014f) (U.S. Fish and Wildlife Service, 2007c).

The wetland amphibians are salamander, toad, and frog species found in either forested or nonforested wetland habitat, such as riparian areas, mangrove forests, marshes, inland freshwater marshes, and seasonally wet prairies. These species generally require both aquatic and adjacent upland habitats that may be dominated by woody or herbaceous vegetation. Wetland amphibians typically occupy lowland water habitats when they are young and upland forested or herbaceous habitats as adults. Some of the frog species have both aquatic and terrestrial life stages; generally, the larvae are aquatic and breathe through gills and the adults are semiterrestrial, breathing with lungs or through moist, glandular skin. Mammal burrows are important to some salamander species for hibernation and protection from weather extremes. Frogs and toads in this sub-group may find shelter in rodent burrows, vegetation, damp soil, or rock crevices. Wetland amphibians typically feed on invertebrate prey, including zooplankton, small crustaceans, insects, and the juveniles of other amphibians.

Most adult wetland amphibians return to lowland water habitats to breed in slow-moving streams, springs, shallow pools, or ephemeral ponds. The breeding and reproduction periods vary widely among these species and can occur during the winter, spring, or early to mid-summer; salamanders tend to breed during the winter months and frogs and toads tend to breed in the spring and summer months. Eggs of wetland amphibians are often attached to submerged aquatic vegetation or benthic substrate (sand, gravel, or mud). Eggs and young are typically unattended by adults.

The habitat needs of wetland amphibians include access to both aquatic or flooded habitats as well as adjacent upland terrestrial habitats with woody or herbaceous vegetation. Many species also require aquatic vegetation for laying eggs. Due to these species' reliance on aquatic environments, suitable water quality is essential.

Of the 20 wetland amphibian species, 11 are endangered and 8 are threatened; 1 species has a population listed as endangered and a population listed as threatened. Critical habitat has been designated for 12 species.

The following representative threats have been synthesized from information available for several species:

- Habitat loss due to urbanization, agriculture, dam construction, road construction, livestock grazing, mining, and human recreational activities;
- Habitat loss due to exotic plants, such as tamarisk and giant reed;
- Predation from introduced species, such as crayfish and bullfrogs;
- Water quality degradation caused by nearby urban and agricultural runoff promoting pollution and siltation;
- Small population sizes and limited distribution causing a decrease in genetic diversity; and
- Disease, including chytridiomycosis, which is believed to be introduced and spread into a native amphibian population by non-native amphibians.

### 4.8.2 Freshwater Amphibians

Information on freshwater amphibians has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 2012e) (U.S. Fish and Wildlife Service, 2015b) (U.S. Fish and Wildlife Service, 1996a).

This sub-group consists of two salamander species, the Ozark hellbender and the San Marcos salamander. These species live in freshwater aquatic habitats, including, but not limited to, cool and flowing streams, springs, rivers, lakes, pools, and reservoirs. The species in this sub-group are permanently aquatic and spend their whole life in freshwater. These amphibians prefer well-oxygenated water that has consistent temperature and flow. Species in this sub-group respire underwater through gills or permeable skin and primarily consume a diet of macroinvertebrates, such as crayfish, crane fly larvae, and amphipods. These salamanders typically dwell underneath mats of algae or aquatic moss or beneath benthic substrate, such as rocks or gravel beds.

The Ozark hellbender usually breeds in the fall or winter while the San Marco salamander usually breeds in the summer. Females of both species lay their eggs on aquatic plant material, on benthic substrate, or on submerged woody debris. The male Ozark hellbenders will defend its nest against predators such as fish and other hellbenders.

The habitat needs for freshwater amphibians include flowing, well-oxygenated water (they respire under water), and aquatic vegetation or a rocky/gravel benthic substrate for shelter. Because these species spend their lives in aquatic habitats, they rely on good water quality to maintain healthy prey populations.

Of the two freshwater amphibians, one is endangered and one is threatened. Critical habitat has been designated for one species.

The following representative threats to freshwater amphibians have been synthesized from information available for several species:

- Loss and modification of habitat from urban development, agriculture, dams, and other human development activities;
- Recreational activities (such as hiking, camping, or swimming) that disturb habitat and nesting sites;
- Predation by introduced predators such as non-native fish and crayfish;
- Disease, namely chytridiomycosis, which is believed to be introduced and spread into a native amphibian population by non-native amphibians;
- Loss of water quality and oxygenation with the introduction of contaminates (fertilizer, heavy metals, sediment);
- Low genetic diversity and viability due to small population size; and
- Loss of spring and stream flow due to lack of rainfall and groundwater pumping. Lack of rainfall may be influenced by climate change.

### 4.8.3 Cave Amphibians

Information on cave amphibians has been synthesized from various sources: (U.S. Fish and Wildlife Service, 1996a) (U.S. Fish and Wildlife Service, 2013i) (U.S. Fish and Wildlife Service, 2014e).

Cave amphibians consist of neotenic salamanders, which do not transform into a terrestrial adult and are permanently aquatic. These species live in subterranean wetted caves that are water-filled from the groundwater of connected aquifer systems. Cave amphibians may also spend some of their time in other sub-surface areas that have a groundwater source, such as a water-filled substrate matrix below a stream bed. Most, but not all, of these salamander species will also spend some time aboveground in springs and pools that may form in wetter months. Species in this sub-group require high quality groundwater for survival that has constant conditions such as temperature, pH, and flow. Cave amphibians consume a diet of aquatic macroinvertebrates such as ostracods, water mites, fly larvae, and amphipods.

Reproduction for cave amphibians is generally unknown because of their sub-surface life cycle. It is likely that reproduction in these species occurs year-round due to their constant habitat conditions. Eggs of these species have not been documented aboveground, so eggs are likely laid belowground. Captive species in this sub-group had females laying their eggs on benthic substrate in the aquarium.

The main habitat need of cave amphibians is a sufficient amount of high quality ground water with consistent pH, temperature, and flow.

Of the six cave amphibian species, three are endangered and three are threatened. Critical habitat has been designated for two species.

The following representative threats to forest land amphibians have been synthesized from information available for several species:

- Loss of spring and aquifer flow due to lack of rainfall and groundwater pumping. Groundwater pumping may be influenced by human demand for well water. Lack of rainfall may be influenced by climate change;
- Recreational activities (such as hiking or spelunking) that disturb habitat;
- Predation by introduced predators such as non-native fish and crayfish; and

- Loss of water quality and oxygenation with the introduction of contaminates (fertilizer, heavy metals, sediment).

### 4.8.4 Forest Land Amphibians

Information on forest land amphibians has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1984e) (U.S. Fish and Wildlife Service, 1991b) (U.S. Fish and Wildlife Service, 1994b) (U.S. Fish and Wildlife Service, 2014d).

Forest land amphibians, which include salamanders and frogs, typically occupy deciduous, evergreen, or mixed forests in mountainous areas. The forest canopy promotes a shaded, cool, and moist ground environment, promoting skin surface moisture, which is vital to several of these species for maintaining skin moisture. The species in this sub-group generally require a constantly moist skin surface for hydration and respiration. The salamander species in this sub-group typically dwell on the forest floor living in damp leaf litter, logs, or rock crevices. The frog species in this subgroup are typically found living in water-filled bromeliads, which are plants that grow on trees, mountainsides, or on the ground and have the ability to store water in the deep pockets between their leaf bases. Amphibians in this sub-group are typically nocturnal, hiding under vegetation and in rock crevices during the day. Forest land amphibians feed on insects and other invertebrates found in the soil or in bromeliads, such as mites.

Forest land amphibians generally reproduce during the spring or summer months. The female salamander species in this sub-group lay eggs in damp logs, moss, or rock crevices, and typically guards them until hatching. The frog species in this sub-group is ovoviviparous. The species in this sub-group are generally unique from other amphibians because they do not have an aquatic stage and do not require proximity to water to breed.

The habitat needs of forest land amphibians include canopy cover, which promotes a shaded, moist ground, allowing these species to maintain the moist skin essential for respiration and hydration. These species also require leaf litter, logs, and rock crevices for shelter. The frog species, the Golden coqui, also often relies on water-filled bromeliads for hydration and shelter.

Of the four forest land amphibian species, two are endangered and two are threatened. Critical habitat has been designated for two species.

The following representative threats to forest land amphibians have been synthesized from information available for several species:

- Loss of habitat from the removal of the forest canopy and forest floor litter due to road development, mining activities, ski slopes, and other human development activities;
- Loss of habitat from human-caused or natural wildfires;
- Degradation of habitat through tree defoliation caused by invasive or pest insects, such as gypsy moths;
- Degradation of habitat through changes in soil chemistry and destruction of canopy vegetation from acid deposition and other air pollution sources; and
- Competition for food and habitat with other aggressive species (red-backed salamander).

Table 4-6 lists all U.S. amphibians, by sub-group, which are listed or proposed threatened or endangered, the State(s) in which they are found, and whether critical habitat has been designated for the species.

## Table 4-6: Threatened and Endangered Amphibians in the U.S.

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Wetland Amphibians – Occur in the Action Area | | | | |
| Reticulated flatwoods salamander | *Ambystoma bishopi* | E | FL, GA | Yes |
| Arroyo (=arroyo southwestern) toad | *Anaxyrus californicus* | E | CA | Yes |
| California tiger salamander, Santa Barbara County DPS | *Ambystoma californiense* | E | CA | Yes |
| California tiger salamander, Sonoma County DPS | | E | CA | Yes |
| California tiger Salamander, Central California DPS | | T | CA | Yes |
| Frosted Flatwoods salamander | *Ambystoma cingulatum* | T | FL, GA, SC | Yes |
| Santa Cruz long-toed salamander | *Ambystoma macrodactylum croceum* | E | CA | No |
| Sonora tiger salamander | *Ambystoma tigrinum stebbinsi* | E | AZ | No |
| Wyoming toad | *Anaxyrus baxteri* | E | WY | No |
| Yosemite toad | *Anaxyrus canorus* | T | CA | No |
| Desert slender salamander | *Batrachoseps aridus* | E | CA | No |
| Houston toad | *Bufo houstonensis* | E | TX | Yes |
| Guajon | *Eleutherodactylus cooki* | T | PR | Yes |
| Llanero coqui | *Eleutherodactylus juanariveroi* | E | PR | Yes |
| Puerto Rican crested toad | *Peltophryne lemur* | T | PR | No |
| Red Hills salamander | *Phaeognathus hubrichti* | T | AL | No |
| Chiricahua leopard frog | *Rana chiricahuensis* | T | AZ, NM | Yes |
| California red-legged frog | *Rana draytonii* | T | CA | Yes |
| Mountain yellow-legged frog, Southern California DPS | *Rana muscosa* | E | CA, NV | Yes |
| Mountain yellow-legged frog, Northern California DPS | | E | CA | No |
| Oregon spotted frog | *Rana pretiosa* | T | CA, OR, WA | No |
| dusky gopher frog | *Rana sevosa* | E | MS, LA, AL | Yes |
| Sierra Nevada yellow-legged frog | *Rana sierrae* | E | CA, NV | No |
| Freshwater Amphibians – Occur in the Action Area | | | | |
| Ozark hellbender | *Cryptobranchus alleganiensis bishopi* | E | AR, MO | No |
| San Marcos salamander | *Eurycea nana* | T | TX | Yes |
| Cave Amphibians – Occur in the Action Area | | | | |
| Salado salamander | *Eurycea chisholmensis* | T | TX | No |
| Georgetown salamander | *Eurycea naufragia* | T | TX | No |
| Barton Springs salamander | *Eurycea sosorum* | E | TX | No |
| Jollyville Plateau salamander | *Eurycea tonkawae* | T | TX | Yes |
| Austin blind salamander | *Eurycea waterlooensis* | E | TX | Yes |
| Texas blind salamander | *Typhlomolge rathbuni* | E | TX | No |
| Forest Land Amphibians – Occur in the Action Area | | | | |
| Golden coqui | *Eleutherodactylus jasperi* | T | PR | Yes |
| Jemez Mountains salamander | *Plethodon neomexicanus* | E | NM | Yes |
| Cheat Mountain salamander | *Plethodon nettingi* | T | WV | No |
| Shenandoah salamander | *Plethodon shenandoah* | E | VA | No |
| Source: (U.S. Fish and Wildlife Service, 2014m)<br>E = Endangered; T = Threatened; PE = Proposed Endangered; PT = Proposed Threatened | | | | |

## 4.9 Fish

Fish are any of the various cold-blooded, aquatic vertebrates, having gills, fins, and typically, an elongated body covered with scales. Fish are divided here into four sub-groups: freshwater resident fish, nearshore marine fish, anadromous fish, and cave fish. Freshwater resident fish and cave fish are under the jurisdiction of the USFWS; NMFS has jurisdiction over nearshore marine fish and anadromous fish (fish that migrate from saltwater into fresh water to spawn or fish that remain in fresh water but migrate upstream to spawn).

### 4.9.1 Freshwater Resident Fish

Information on freshwater resident fish has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, Bay Delta Fish and Wildlife Office, 2013) (U.S. Fish and Wildlife Service, 1985b) (U.S. Fish and Wildlife Service, 1994c) (U.S. Fish and Wildlife Service, 1994d) (U.S. Fish and Wildlife Service, 2007d) (U.S. Fish and Wildlife Service, Southeast Region, 2009b) (NatureServe, 2009a) (U.S. Fish and Wildlife Service, Southeast Region – Georgia Ecological Services Field Office, 2009) (U.S. Fish and Wildlife Service, Southeast Region, 2012).

Freshwater resident fish include taxonomically diverse species that occupy a particular freshwater body of water or watershed for their entire life cycle. This body of water could be a large river or lake, a particular estuary, an underground stream, or a small spring-fed desert oasis, many of which are isolated as a result of geologic or hydrologic processes.

Habitats used by freshwater resident fish vary widely depending on the species, but include cold mountain streams, spring-fed pools, the meandering waterways of large rivers, or the brackish water areas of estuaries. Freshwater resident fish are found in both shallow and deep portions of rivers, streams, lakes, reservoirs, and estuaries. Many of the freshwater resident species are habitat specialists or have adapted to rather extreme environments, such as isolated desert pools, canyons subject to extreme flooding, or highly alkaline waters.

Feeding strategies of freshwater resident fish vary widely, from bottom feeders of invertebrates to top-tier predators of other fish. Species within this sub-group include small, relatively short-lived fish (such as pupfish and dace), as well as large, long-lived fish (such as sturgeon and suckers). Many of the ESA listed or proposed fish in this sub-group are only found (endemic to) one or a few bodies of water and have limited ranges. Some freshwater resident species may migrate within their range to reach breeding grounds or take advantage of seasonal resources. Shiners, darters, dace, logperch, sculpin, and madtom are small fish that typically inhabit small streams and the margins of larger waterways. Suckers, shiners, and chubs typically inhabit lakes or slow moving streams and rivers and are tolerant of warm water temperatures. Pupfish, gambusia, and springfish inhabit isolated spring-fed pools and waterways in deserts. Freshwater resident sturgeon are large, slow-growing fish of large waterways.

Habitats used by freshwater resident fish vary widely depending on the species, but include cold mountain streams, spring-fed pools, the meandering waterways of large rivers, or the brackish water areas of estuaries. Freshwater resident fish are found in both shallow and deep portions of rivers, streams, lakes, reservoirs, and estuaries. Many of the freshwater resident species are habitat specialists or have adapted to rather extreme environments, such as isolated desert pools, canyons subject to extreme flooding, or highly alkaline waters.

Needs for freshwater resident fish include aquatic habitat of suitable water quality; aquatic habitat with suitable depths or flows; access to spawning, rearing, and holding areas; available suitable forage; suitable cover or protection from excessive predation; and protection from excessive fishing or collection to maintain populations.

Of the 121 freshwater resident fish species, 41 are threatened and 80 are endangered, and 70 have critical habitat designated.

The following representative threats to resident fish species have been synthesized from information available for several species:

- Creation of dams and diversions that have fragmented habitat, altered flow regimes, and restrict fish movement;
- Erosion and sedimentation of habitat from agricultural, urban, and infrastructure development;
- Reduction in spring-water discharges due to groundwater extraction;
- Introduction of non-native fish that compete with or prey on fish within this sub-group;
- Degradation of genetic integrity caused by hybridization with introduced, closely related taxa;
- Non-point source pollution from agricultural and urban areas;
- Channelization of waterways, which changes flow regimes, decreases habitat complexity, and alters sediment transport;
- Capture or death of individuals from illegal fishing or collection for aquarium fish; and
- Destruction of riparian habitat which contributes to shelter and the food webs of riverine habitat.

### 4.9.2 Nearshore Marine Fish

Information on nearshore marine fish has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, Ventura Fish and Wildlife Office, 2007) (NatureServe, 2009b) (U.S. Fish and Wildlife Service, Bay Delta Fish and Wildlife Office, 2013) (National Marine Fisheries Service, 2014f) (National Marine Fisheries Service, 2014g) (National Marine Fisheries Service, 2014h).

Nearshore marine fish complete their entire life cycle in nearshore marine waters, including ocean waters along the coastline and the protected salt waters of bays. One of these species (smalltooth sawfish) sometimes forages within estuarine areas, but does not enter freshwater as anadromous fish do (National Marine Fisheries Service, 2015e). Scalloped hammerhead sharks are wide-ranging fish that move throughout nearshore tropical waters (National Marine Fisheries Service, 2014f). Rockfish are associated with kelp forests and rocky habitat and do not make migrational movements. Nearshore marine fish include benthic fish that live and feed near the bottom (sawfish, scalloped hammerhead shark, and rockfish). These bottom-oriented fish feed on a variety of invertebrates and fish.

Reproduction of nearshore marine species varies widely, as some species are viviparous (giving birth to live young), while others are broadcast spawners (eggs are fertilized in the water) with a planktonic larval stage (drifting on currents).

Needs for these fish include nearshore marine habitats free from contaminants; access to spawning, rearing, and holding areas; available suitable forage; suitable cover or protection from excessive predation or entrainment at water intake facilities; and to maintain populations, protection from excessive fishing, bycatch, or collection.

Of the five nearshore marine fish species, two are endangered, two are threatened, and one has multiple distinct populations that are either endangered or threatened. Critical habitat designated has been designated for one species.

The following representative threats to nearshore marine fish have been synthesized from information available for several species:

- Entrainment by water intakes;
- Alteration of salinity or flow regimes in estuarine areas due to upstream water exports;
- Overfishing or bycatch in other fisheries;
- Non-point source pollution from agricultural and urban areas;
- Alteration of estuarine habitats due to dredging and channelization;
- Loss of nearshore habitats, such as mangrove forests and seagrass beds due to development and coastal erosion; and
- Changing habitat conditions influenced by climate change.

### 4.9.3 Anadromous Fish

Information on anadromous fish has been synthesized from a variety of sources: (National Marine Fisheries Service, 2013a) (National Marine Fisheries Service, 2014a) (National Marine Fisheries Service, 2014b) (National Marine Fisheries Service, 2014c) (National Marine Fisheries Service, 2014d) (National Marine Fisheries Service, 2014e).

Habitats used by this anadromous fish include both nearshore and offshore marine waters, as well as freshwater rivers, streams, lakes, and estuaries. Anadromous fish mature in oceanic environments rich in food and migrate to spawn in rivers and streams where there is less predation of eggs and juvenile fish (Willson, 1997). Sub-adults and adults forage in nearshore and offshore marine waters during growth to maturity. Spawning typically occurs in freshwater streams with suitable substrate and water quality, which vary by species. After spawning, larvae and juveniles typically remain in freshwater habitat for some time before migrating back to the ocean. Some anadromous species only migrate short distances up natal waterways, while others may migrate hundreds of miles upstream to reach spawning locations. There are three classes of anadromous fish: sturgeon, salmonids, and smelt (the only smelt in this sub-group is the eulachon). Sturgeon are long-lived, large fish that do not reach sexual maturity until 10 or more years of age; once sexual maturity is reached, sturgeon will return to natal waters every few years to spawn. Salmon and eulachon are smaller than sturgeon, reach sexual maturity more quickly, and typically die after spawning in their natal waters.

Sturgeon are bottom-oriented and feed primarily on benthic invertebrates, while salmon and eulachon are typically found in the water column, feeding on plankton, invertebrates, or other fish, depending on the species and life-stage.

The habitat needs of anadromous fish are complex and vary throughout the life cycle of the species. Anadromous fish require passable migratory pathways from marine foraging habitat to freshwater spawning areas; freshwater areas with substrates, flow rates, and water quality suitable for spawning; freshwater foraging areas with suitable water quality, prey items, and free from excessive predation; estuarine and nearshore/offshore marine waters with suitable prey items, water quality, and freedom from excessive predation or pressure from recreational/commercial fishing.

Of the 11 anadromous fish species, 2 are endangered, 4 are threatened, and 5 have populations that are both endangered and threatened. Critical habitat has been designated for seven species.

The following representative threats to anadromous fish have been synthesized from information available for several species:

- Creation of dams and diversions that have fragmented habitat, altered flow regimes, and prevented fish from accessing spawning and rearing areas;
- Erosion and sedimentation of habitat from agricultural, urban, and infrastructure development;
- Reduction in availability of habitat and flows due to water withdrawals for agricultural and urban use;
- Entrainment into water diversions;
- Introduction of non-native fish that compete with or prey on fish within this group;
- Degradation of genetic integrity caused by hybridization with hatchery stock derived from non-indigenous populations;
- Non-point source pollution from agricultural and urban areas;
- Dredging and channelization of waterways, which changes flow regimes, decreases habitat complexity, and alters sediment transport;
- Capture or death of individuals from illegal fishing or bycatch of commercial fisheries;
- Diseases spreading from aquaculture facilities to wild populations; and
- Alteration of oceanic conditions and freshwater flows influenced by climate change.

### 4.9.4 Cave Fish

Information on cave fish has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 2015e) (U.S. Fish and Wildlife Service, 2015d) (U.S. Fish and Wildlife Service, 1990f).

This sub-group includes three species that exclusively occupy pools and flooded passageways in karst caves. Habitats used by cave fish are limited to pools and flooded passageways in karst caves. Juvenile grotto sculpin may inhabit waters flowing into karst caves at the surface, but adults are generally found in subterranean areas (Missouri Department of Conservation, 2015b). Like other cave-dwelling animals, cave fish have reduced pigmentation and eyes, or no eyes at all. These species may have ranges limited to one cavern or cave system. These species feed on cave-dwelling invertebrates as well as invertebrates and other food items that are washed into the cave system from aboveground areas. In some cave systems, bat droppings provide a source of nutrients for cave food webs (Missouri Department of Conservation, 2015a). Cave fish often exhibit slow growth, low reproductive rates, and long lifespans as a result of living in such stable and energy limited systems (Missouri Department of Conservation, 2015a).

Needs for cave fish include: aquatic habitat of suitable water quality; access to food sources that enter the cave system (such as bat guano); and protection from collection in order to maintain populations.

Of the three cave fish species, one is threatened and two are endangered. Critical habitat has been designated for two species.

The following representative threats have been synthesized from information available for several species:

- The filling or closure of sinkholes or cave entrances which reduces terrestrial inputs to supporting habitat;
- Erosion and sedimentation of waterways that flow into caves from agricultural, urban, and infrastructure development;

- Reduction in spring-water discharges due to groundwater extraction;
- Habitat disturbance from recreational cave exploration;
- Non-point source pollution from agricultural and urban areas that enters aquatic habitat for these species; and
- Capture or death of individuals from collection for aquarium fish.

Table 4-7 lists all U.S. fish, by sub-group, which are listed or proposed threatened or endangered, the State(s) in which they are found, and whether critical habitat has been designated for the species.

**Table 4-7: Threatened and Endangered Fish in the U.S.**

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Freshwater Resident Fish – Occur in the Action Area | | | | |
| White sturgeon, Kootenai River Population | *Acipenser transmontanus* | E | MT, ID | Yes |
| Zuni bluehead sucker | *Catostomus discobolus yarrowi* | E | AZ, NM | No |
| Modoc sucker | *Catostomus microps* | E | CA, OR | Yes |
| Santa Ana sucker | *Catostomus santaanae* | T | CA | Yes |
| Warner sucker | *Catostomus warnerensis* | T | CA, NV, OR | Yes |
| Shortnose Sucker | *Chasmistes brevirostris* | E | CA, OR | Yes |
| Cui-ui | *Chasmistes cujus* | E | NV | No |
| June sucker | *Chasmistes liorus* | E | UT | Yes |
| Laurel dace | *Chrosomus saylori* | E | TN | Yes |
| Pygmy sculpin | *Cottus paulus (=pygmaeus)* | T | AL | No |
| Diamond darter | *Crystallaria cincotta* | E | WV; Entire | Yes |
| White River springfish | *Crenichthys baileyi* | E | NV | Yes |
| Hiko White River springfish | *Crenichthys baileyi grandis* | E | NV | Yes |
| Railroad Valley springfish | *Crenichthys nevadae* | T | NV | Yes |
| Beautiful shiner | *Cyprinella formosa* | T | AZ, NM | Yes |
| Blue shiner | *Cyprinella caerulea* | T | AL, GA, TN | No |
| Leon Springs pupfish | *Cyprinodon bovinus* | E | TX | Yes |
| Devils Hole pupfish | *Cyprinodon diabolis* | E | NV | No |
| Comanche Springs pupfish | *Cyprinodon elegans* | E | TX | No |
| Desert pupfish | *Cyprinodon macularius* | E | AZ, CA | Yes |
| Ash Meadows Amargosa pupfish | *Cyprinodon nevadensis mionectes* | E | NV | Yes |
| Warm Springs pupfish | *Cyprinodon nevadensis pectoralis* | E | NV | No |
| Owens pupfish | *Cyprinodon radiosus* | E | CA | No |
| Lost River sucker | *Deltistes luxatus* | E | CA, OR | Yes |
| Devils River minnow | *Dionda diaboli* | T | TX | Yes |
| Guadalupe roundnose minnow | *Dionda nigrotaeniata* | E | TX | No |
| Spring pygmy sunfish | *Elassoma alabamae* | T | AL | No |
| Pahrump poolfish | *Empetrichthys latos* | E | NV | No |
| Desert dace | *Eremichthys acros* | T | NV | Yes |
| Spotfin chub | *Erimonax monachus* | T | AL, NC, TN, VA, GA | Yes |
| Slender chub | *Erimystax cahni* | T | TN, VA | Yes |
| Bluemask (=jewel) darter | *Etheostoma sp.* | E | TN | No |
| Slackwater darter | *Etheostoma boschungi* | T | AL, TN | Yes |
| Vermilion darter | *Etheostoma chermocki* | E | AL | Yes |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Relict darter | *Etheostoma chienense* | E | KY | No |
| Etowah darter | *Etheostoma etowahae* | E | GA | No |
| Fountain darter | *Etheostoma fonticola* | E | TX | Yes |
| Yellowcheek darter | *Etheostoma moorei* | E | AR | Yes |
| Niangua darter | *Etheostoma nianguae* | T | MO | Yes |
| Watercress darter | *Etheostoma nuchale* | E | AL | No |
| Okaloosa darter | *Etheostoma okaloosae* | T | FL | No |
| Duskytail darter | *Etheostoma percnurum* | E | KY, TN, VA | No |
| Rush Darter | *Etheostoma phytophilum* | E | AL | Yes |
| Bayou darter | *Etheostoma rubrum* | T | MS | No |
| Cherokee darter | *Etheostoma scotti* | T | GA | No |
| Maryland darter | *Etheostoma sellare* | E | MD; Possibly extinct | Yes |
| Cumberland darter | *Etheostoma susanae* | E | KY, TN | Yes |
| Tippecanoe darter | *Etheostoma tippecanoe* | E | IN, KY, OH, PA, TN, WV | No |
| Boulder darter | *Etheostoma wapiti* | E | AL, TN | No |
| Tidewater goby | *Eucyclogobius newberryi* | E | CA | Yes |
| Big Bend gambusia | *Gambusia gaigei* | E | TX | No |
| San Marcos gambusia | *Gambusia georgei* | E | TX; Possibly extinct | Yes |
| Clear Creek gambusia | *Gambusia heterochir* | E | TX | No |
| Pecos gambusia | *Gambusia nobilis* | E | NM, TX | No |
| Unarmored threespine stickleback | *Gasterosteus aculeatus williamsoni* | E | CA | No |
| Hutton tui chub | *Gila bicolor ssp.* | T | OR | No |
| Mohave tui chub | *Gila bicolor ssp. Mohavensis* | E | CA | No |
| Owens tui chub | *Gila bicolor ssp. Snyderi* | E | CA | Yes |
| Borax Lake chub | *Gila boraxobius* | E | OR | Yes |
| Humpback chub | *Gila cypha* | E | AZ, CO, UT, WY | Yes |
| Sonora chub | *Gila ditaenia* | T | AZ | Yes |
| Bonytail chub | *Gila elegans* | E | AZ, CA, CO, NV, UT, WY | Yes |
| Gila chub | *Gila intermedia* | E | AZ, NM | Yes |
| Chihuahua chub | *Gila nigrescens* | T | NM | No |
| Yaqui chub | *Gila purpurea* | E | AZ | Yes |
| Pahranagat roundtail chub | *Gila robusta jordani* | E | NV | No |
| Virgin River chub | *Gila seminuda (=robusta)* | E | AZ, NV, UT | Yes |
| Rio Grande silvery minnow | *Hybognathus amarus* | E | TX, NM | Yes |
| Delta smelt | *Hypomesus transpacificus* | T | CA | Yes |
| Yaqui catfish | *Ictalurus pricei* | T | AZ | Yes |
| White River spinedace | *Lepidomeda albivallis* | E | NV | Yes |
| Big Spring spinedace | *Lepidomeda mollispinis pratensis* | T | NV | Yes |
| Little Colorado spinedace | *Lepidomeda vittata* | T | AZ | Yes |
| Spikedace | *Meda fulgida* | E | AZ, NM | Yes |
| Waccamaw silverside | *Menidia extensa* | T | NC | Yes |
| Moapa dace | *Moapa coriacea* | E | NV | No |
| Palezone shiner | *Notropis albizonatus* | E | AL, KY | No |
| Smalleye Shiner | *Notropis buccula* | E | TX | Yes |
| Cahaba shiner | *Notropis cahabae* | E | AL | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Arkansas River shiner | *Notropis girardi* | T | AR, KS, NM, OK, TX | Yes |
| Cape Fear shiner | *Notropis mekistocholas* | E | NC | Yes |
| Sharpnose shiner | *Notropis oxyrhynchus* | E | TX | Yes |
| Pecos bluntnose shiner | *Notropis simus pecosensis* | T | NM | Yes |
| Topeka shiner | *Notropis topeka (=tristis)* | E | IA, KS, MN, MO, NE, SD | Yes |
| Smoky madtom | *Noturus baileyi* | E | TN | Yes |
| Chucky madtom | *Noturus crypticus* | E | TN | Yes |
| Yellowfin madtom | *Noturus flavipinnis* | T | TN, VA | Yes |
| Neosho madtom | *Noturus placidus* | T | KS, MO, OK | No |
| Pygmy madtom | *Noturus stanauli* | E | TN | No |
| Scioto madtom | *Noturus trautmani* | E | OH; Possibly extinct | No |
| Apache trout | *Oncorhynchus apache* | T | AZ | No |
| Little Kern golden trout | *Oncorhynchus aguabonita whitei* | T | CA | Yes |
| Lahontan cutthroat trout | *Oncorhynchus clarkii henshawi* | T | CA, NV, OR, UT | No |
| Paiute cutthroat trout | *Oncorhynchus clarkii seleniris* | T | CA | No |
| Greenback cutthroat trout | *Oncorhynchus clarki stomias* | T | CO, UT | No |
| Gila trout | *Oncorhynchus gilae* | T | AZ, NM | No |
| Oregon chub | *Oregonichthys crameri* | T | OR | Yes |
| Amber darter | *Percina antesella* | E | GA, TN, AL | Yes |
| Goldline darter | *Percina aurolineata* | T | AL, GA, TN | No |
| Conasauga logperch | *Percina jenkinsi* | E | GA, TN | Yes |
| Leopard darter | *Percina pantherina* | T | AR, OK | Yes |
| Roanoke logperch | *Percina rex* | E | NC, VA | No |
| Snail darter | *Percina tanasi* | T | AL, GA, TN | Yes |
| Blackside dace | *Phoxinus cumberlandensis* | T | KY, TN, VA | No |
| Woundfin | *Plagopterus argentissimus* | E | AZ, NM, NV, UT | Yes |
| Gila topminnow (incl. Yaqui) | *Poeciliopsis occidentalis* | E | AZ, NM | No |
| Colorado pikeminnow (=squawfish) | *Ptychocheilus lucius* | E | AZ, CA, CO, NM, UT, WY, NV, | Yes |
| Foskett speckled dace | *Rhinichthys osculus ssp.* | T | OR | No |
| Independence Valley speckled dace | *Rhinichthys osculus lethoporus* | E | NV | No |
| Ash Meadows speckled dace | *Rhinichthys osculus nevadensis* | E | NV | Yes |
| Clover Valley speckled dace | *Rhinichthys osculus oligoporus* | E | NV | No |
| Kendall Warm Springs dace | *Rhinichthys osculus thermalis* | E | WY | No |
| Bull trout | *Salvelinus confluentus* | T | CA, ID, MT, NV, OR, WA | Yes |
| Pallid sturgeon | *Scaphirhynchus albus* | E | AR, IA, IL, KS, KY, LA, MO, MS, MT, ND, NE, SD, TN | No |
| Alabama sturgeon | *Scaphirhynchus suttkusi* | E | MS, AL | Yes |
| Loach minnow | *Tiaroga cobitis* | E | AZ, NM | Yes |
| Razorback sucker | *Xyrauchen texanus* | E | AZ, CA, CO, NM, NV, UT, WY | Yes |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Nearshore Marine Fish – Occur in the Action Area | | | | |
| Smalltooth sawfish, United States DPS | *Pristis pectinata* | E | AL, FL, GA, LA, MS, NC, SC; TX | Yes |
| Bocaccio, Puget Sound-Georgia Basin DPS | *Sebastes paucispinis* | E | AK, CA | No |
| Canary rockfish, Puget Sound-Georgia Basin DPS | *Sebastes pinniger* | T | AK, CA | No |
| Yelloweye rockfish, Puget Sound-Georgia Basin DPS | *Sebastes ruberrimus* | T | AK, CA | No |
| Scalloped hammerhead shark, Central and Southwest Atlantic DPS | *Sphyrna lewini* | T | FL, PR | No |
| Scalloped hammerhead shark, Eastern Pacific DPS | | E | CA | |
| Anadromous Fish – Occur in the Action Area | | | | |
| Shortnose sturgeon | *Acipenser brevirostrum* | E | CT, DE, FL, GA, MA, MD, ME, NC, NJ, NY, PA, RI, SC, VA | No |
| Green sturgeon, Southern DPS | *Acipenser medirostris* | T | AK, CA, OR, WA | No |
| Atlantic sturgeon (Gulf subspecies) | *Acipenser oxyrinchus (=oxyrhynchus) desotoi* | T | AL, FL, LA, MS, GA | Yes |
| Atlantic Sturgeon, Carolina DPS | *Acipenser oxyrinchus* | E | NC, SC, VA | No |
| Atlantic Sturgeon, Chesapeake Bay DPS | | E | DE, MD, PA, VA | |
| Atlantic Sturgeon, New York Bight DPS | | E | CT, DE, MD, NY, PA, RI | |
| Atlantic Sturgeon, South Atlantic DPS | | E | FL, GA, SC | |
| Atlantic Sturgeon, Gulf of Maine DPS | | T | MA, ME, NH | |
| Chinook salmon, California Coastal ESU | *Oncorhynchus (=Salmo) tshawytscha* | E / T | CA | Yes |
| Chinook salmon, Central Valley Spring ESU | | T | CA | |
| Chinook salmon, Sacramento Winter ESU | | E | CA | |
| Chinook salmon, California Coastal ESU | | T | CA | |
| Chinook salmon, Lower Columbia ESU | | T | OR, WA | |
| Chinook salmon, Upper Columbia Spring ESU | | E | WA | |
| Chinook salmon, Puget Sound ESU | | T | WA | |
| Chinook salmon, Snake River Fall ESU | | T | ID, OR, WA | |
| Chinook salmon, Snake River Spring/Summer ESU | | T | ID, OR, WA | |
| Chinook salmon, Upper Willamette River ESU | | T | OR | |
| Chum salmon, Hood Canal Summer ESU | *Oncorhynchus keta* | T | WA | Yes |
| Chum salmon, Columbia River ESU | *Oncorhynchus keta* | T | OR, WA | Yes |
| Coho salmon, Central California Coast ESU | *Oncorhynchus (=Salmo) kisutch* | E | CA, | Yes |
| Coho salmon, Southern OR/Northern CA Coast ESU | | T | CA, OR | Yes |
| Coho salmon, Oregeon Coast ESU | | T | OR | Yes |
| Coho salmon, Lower Columbia ESU | | T | OR, WA | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Steelhead, Southern California DPS | *Oncorhynchus (=Salmo) mykiss* | E | CA | Yes |
| Steelhead, South-Central CA DPS | | T | CA | |
| Steelhead, Central California Coast DPS | | T | CA | |
| Steelhead, California Central Valley DPS | | T | CA | |
| Steelhead, Northern California DPS | | T | CA | |
| Steelhead, Lower Columbia DPS | | T | OR, WA | |
| Steelhead, Middle Columbia DPS | | T | OR, WA | |
| Steelhead, Upper Columbia DPS | | T | OR, WA | No |
| Steelhead, Snake River Basin DPS | | T | CA, ID, OR, WA | Yes |
| Steelhead, Upper Willamette River DPS | | T | | |
| Sockeye salmon, Ozette Lake ESU | *Oncorhynchus (=Salmo) nerka* | T | WA | Yes |
| Sockeye salmon, Snake River ESU | | E | CA, OR, WA, ID | |
| Atlantic salmon, Gulf of Maine DPS | *Salmo salar* | E | ME | Yes |
| Eulachon, Southern DPS | *Thaleichthys pacificus* | T | CA | No |
| Cave Fish – Occur in the Action Area | | | | |
| Ozark cavefish | *Amblyopsis rosae* | T | AR, MO, OK | No |
| Grotto sculpin | *Cottus specus* | E | MO | Yes |
| Alabama cavefish | *Speoplatyrhinus poulsoni* | E | AL | Yes |
| Source: (U.S. Fish and Wildlife Service, 2014m)<br>E = Endangered; T = Threatened; PE = Proposed Endangered; PT = Proposed Threatened | | | | |

## 4.10 Invertebrates

Invertebrates account for more than 95 percent of all animals on earth, and are found almost everywhere in both terrestrial and aquatic environments. Invertebrates include any living animal that does not have a backbone; animals that make up this large species group include insects, worms, clams, snails, crayfish, and shrimp.

This species group includes both aquatic and terrestrial invertebrates. Invertebrates are found in a wide variety of habitats represented by nine sub-groups: forested wetland invertebrates (snails, insects, and arachnids); nonforested wetland invertebrates (snails and insects); fresh water invertebrates (mussels, snails, crustaceans, and insects); nearshore marine invertebrates (corals and snails); beach invertebrates (snails and insects); barren land invertebrates (snails, crustaceans, insects, and arachnids); cave invertebrates (insects and arachnids); rangeland invertebrates (insects); and forest land invertebrates (snails, insects, and arachnids). All species are under the jurisdiction of USFWS, except for the marine invertebrates (snails and corals), which are regulated by NMFS. Threatened and endangered invertebrates in the U.S. are all listed as threatened or endangered; there are no U.S. species of invertebrates proposed for listing.

### 4.10.1 Forested Wetland Invertebrates

Information on forested wetland invertebrates has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 2006c) (U.S. Fish and Wildlife Service, 2008a) (U.S. Fish and Wildlife Service, 2010c) (U.S. Fish and Wildlife Service, 2014c).

Snails and insects (beetles, butterflies, damselflies, and flies) are both found in the forested wetland habitat, and these various species use different components of this habitat. Some forested wetland invertebrates are dependent on the cool, moist conditions created under the forest canopy within waterfall spray, whereas other forested wetland invertebrates depend on a

specific host plant found only in a specific location (such as the humid Everglades region). Most forested wetland invertebrates require the cycling of clean water within the habitat.

Snails generally feed on algae, detritus, microbes, and other vegetation growing on submerged rocks. Beetles are generally predatory, with adults and larvae hunting using sight. Beetles typically hunt smaller invertebrates. Butterflies are typically dependent on specific plants, such as a larval host plant and a nectar plant for feeding when an adult. Damselflies are predatory, hunting smaller insects while in flight. Flies in wetland and coastal environments are typically generalists, feeding on microbes and decaying plant material.

Snails tend to be dimorphic, although hermaphrodism does exist in nearly all pulmonate species. Some snail species lay eggs from which a free-swimming larvae hatches. Beetles generally lay eggs in early winter, with four successive stages: larva, pre-pupa, pupa, and adult. Beetles may have a mating process that is species-specific. Butterflies generally lay eggs in the debris and dried stems of the larval host plant. After hatching, caterpillars may enter a diapause (animal dormancy) for overwintering. After passing though several development phases, the caterpillar forms a chrysalis and after a few weeks, the adult butterfly emerges. Each stage in the life cycle generally takes seven days, with adults typically living about one year. Flies generally lay eggs in the decomposing bark of trees, and hatchlings fall to the ground to pupate. Some species of Hawaiian damselflies have terrestrial naiads. These naiads typically are found on wet rock faces or in damp terrestrial conditions (such as leaf litter or moist leaf axils several feet above the ground) and are typically unable to swim.

The habitat needs of forested wetland invertebrates include a cool, moist environment promoted by adequate forest canopy, as well as damp leaf litter and vegetation. Consistently clean water free from pollutants is essential.

Of the 19 species of forested wetland invertebrates, 15 are listed as endangered, and 4 as threatened. Critical habitat has been designated for five species.

The following representative threats have been synthesized from information available for several forested wetland species:

- Habitat destruction due to wetland drain and fill;
- Sea level rise and severe weather conditions (hurricanes, floods, storms);
- Changes in natural fire regimes[16] and succession[17], and fuels reduction[18] projects;
- Recreational development projects;
- Alteration of flora due to intrusion of non-native species;
- Chemical and water pollution; and
- Illegal collection and trade.

### 4.10.2 Nonforested Wetland Invertebrates

Information on nonforested wetland invertebrates has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1995c) (U.S. Fish and Wildlife Service, 1998e) (U.S. Fish and Wildlife Service, 2005a) (U.S. Fish and Wildlife Service, 2005d). Nonforested wetland

[16] A natural fire regime is the pattern, frequency, duration, and intensity of a wildfire in an area.

[17] Succession is the change in an ecological community over time.

[18] Fuels reduction projects remove dry brush and grasses to decrease the spread of wildfires.

invertebrates include snails, crustaceans (fairy shrimp), and insects (beetles), and include species with habitats in vernal pools (temporary shallow pools), wet meadows, and marshes. ESA listed nonforested wetland species are endemic to specific restricted ranges.

Snails are restricted to wet soils or shallow standing water, although some species may utilize vole burrows. Fairy shrimp are found in the water column of vernal pools, which are shallow, temporary pools. ESA listed beetles are associated with vernal pools, or often found in vegetation or in cracks in the ground.

Snails feed on host plants, algae, fungi, and bacteria. Fairy shrimp swim on the pool surface with legs up, ventral side down, seemingly upside-down. These shrimp may be filter feeders as well as using legs to scrape algae is scraped from the surface of the water. Beetles are predatory, feeding on smaller invertebrates.

Most pulmonate snails are hermaphroditic and capable of self-fertilization. ESA listed species live for approximately one year, reproducing in the summer months and undergoing dormancy in the winter. Fairy shrimp utilize a brood pouch, where embryos develop. Species of fairy shrimp may be differentiated by the shape and position of the brood pouch. Eggs are laid in the pool and do not hatch until the vernal pool is replenished. Beetles emerge from diapause to lay eggs in early winter. Beetles live for approximately one year, and are believed to be active during the winter, emerging at the beginning of winter rains and remaining active during the winter to spring wet season.

The habitat needs of nonforested wetland invertebrates include wet soils and the presence of shallow pools. Because of the species' reliance on water, good water quality is essential. Many of these species also rely on wetland or aquatic vegetation for food and shelter.

Of the 11 species of nonforested wetland invertebrates, 9 are endangered and 2 are threatened; critical habitat has been designated for 8 species.

The following representative threats to nonforested wetland invertebrate have been synthesized from information available for several species:

- Habitat loss and fragmentation due to urbanization, infrastructure, and agriculture;
- Altered hydrology;
- Alteration of flora due to intrusion of non-native species;
- Overgrazing of vegetative cover; and
- High flow events, severe weather conditions, and floods.

### 4.10.3 Freshwater Invertebrates

Information on freshwater invertebrates has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1984g) (U.S. Fish and Wildlife Service, 1989a) (U.S. Fish and Wildlife Service, 1990c) (U.S. Fish and Wildlife Service, 1993d) (U.S. Fish and Wildlife Service, 1994e) (U.S. Fish and Wildlife Service, 1995b) (U.S. Fish and Wildlife Service, 1996a) (U.S. Fish and Wildlife Service, 1997d) (U.S. Fish and Wildlife Service, 2000b) (U.S. Fish and Wildlife Service, 2002a) (U.S. Fish and Wildlife Service, 2003d) (U.S. Fish and Wildlife Service, 2004) (U.S. Fish and Wildlife Service, 2006a) (U.S. Fish and Wildlife Service, 2006b) (U.S. Fish and Wildlife Service, 2006e) (U.S. Fish and Wildlife Service, 2010c) (U.S. Fish and Wildlife Service, 2013a) (U.S. Fish and Wildlife Service, 2014b).

Freshwater invertebrates occur in or have a life cycle stage within a body of fresh or brackish water, typically a river, stream, lake, or estuary. Freshwater invertebrates are diverse, and include mussels, snails, crustaceans, and insects.

Once entering the adult phase, mussels are sessile, living in communities in the substrate of moving water such as rivers and streams. Mussels are generally endemic to a specific river system, and populations are easily fragmented. Snails are widespread in the freshwater environment, with habitat on rocks, sand, and other substrate in rivers, lakes, estuaries, and springs. Crustaceans inhabit the substrate of several types of habitat, including rivers, streams, estuaries, springs, and pools. Freshwater invertebrates include two types of purely aquatic insects, beetles, and naucoroids. Beetles may be surface-dwelling or substrate-dwelling. Naucorids generally exist where water flows over rocks and pebbles. Water beetles live in stream riffles. Two types of insects that exhibit an aquatic life cycle stage, dragonflies and damselflies, have larvae found in stream pools and open water.

Mussels filter-feed on algae, plant detritus, and bacteria from the water flowing over the top of the mussel. Freshwater snails generally feed on algae, plant detritus, microbes, and other vegetation growing on submerged rocks. Crustaceans tend to graze on plant detritus, microbes, protozoans, and algae. Naucorids feed on larvae of other aquatic insects, whereas beetles are herbivorous, often found in areas of dense aquatic vegetation. Dragonfly nymphs and damselfly naiads are aquatic and feed on smaller aquatic insects; adults are generally predatory, hunting and capturing insects while flying.

Mussels exhibit discrete genders with a distinct breeding season. Larvae are released into the streamflow and attach to a host fish using hooks or spines on the outside of their bodies. Freshwater snails tend to be dimorphic (having two distinct forms), although hermaphrodism does exist in nearly all pulmonate (air breathing) snail species. Crustaceans typically exhibit discrete genders, although some species of shrimp are hermaphrodites and other crustaceans may change sex during their lifespan. Aquatic insect reproduction is seasonal, generally occurring in early spring to summer. Dragonfly and damselfly eggs and nymphs are aquatic.

Of the 136 freshwater invertebrate species, 110 are endangered, 23 are threatened, and 3 are proposed endangered. Critical habitat has been designated for 59 species.

The following representative threats to freshwater invertebrates have been synthesized from information available for several species:

- Impoundment and population fragmentation due to locks and dams or high flow releases from dams;
- Non-point source pollution, especially from fertilizers;
- Groundwater contamination and depletion;
- Sedimentation from intensive land use, land use changes, and wetland drain and fill;
- Stream channelization and maintenance to allow for boat passage and flood control;
- Gravel and sand mining;
- Decimation of host fish populations;
- Low reproductive success;
- Competition from exotic species (i.e., zebra mussels, quagga mussels, golden mussels);
- Overharvesting;

- Water quality changes and/or contamination including agricultural, municipal, industrial, and mining runoff;
- Decimation of host fish population, including predation by non-native fish; and
- Mosquito control measures.

### 4.10.4 Nearshore Marine Invertebrates

Information on marine invertebrates has been synthesized from a variety of sources: (Smith, 2003) (National Marine Fisheries Service, 2013b) (National Oceanic and Atmospheric Administration, 2014a) (National Marine Fisheries Service, 2014j) (U.S. Fish and Wildlife Service, 2014k). Marine invertebrates include snails and corals. All listed marine invertebrates are located in nearshore marine waters.

Shells of marine snails may resemble globes or have a flattened appearance, exhibit different thicknesses and size, and may have spines or ridges. Listed marine snails are present in the rocky intertidal zone and at depths of 80 feet to 100 feet, and are generally found wedged between intertidal and sub-tidal rocks or in boulder habitat interspersed with sand channels. Spaces between rocks and sand channels may be important for the channeling and collection of the algae on which marine snails feed. Corals are colonial animals; each coral is composed of thousands of small animals. Corals are located on the ocean floor at a depth of 3 feet, limited by wave action, to a depth 100 feet, limited by the amount of available light. All listed coral species are tropical stony corals.

Listed snails are herbivores feeding on kelp and algae varieties. Tropical corals have a symbiotic (interdependent) relationship with algae, and receive most of their energy from the organic byproducts of photosynthesis. However, corals are also predators, and may capture and consume living small fish and zooplankton.

In the case of the marine abalone, gametes are released into the ocean, producing free-swimming larvae. After approximately 15 days, the larvae create the shell and settle into a rocky crevice. As the abalone grows, they increase in size and seek out unsheltered habitat. Reproduction of stony corals is typically asexual, with new colonies forming through grafting of coral pieces that have broken. Sexual reproduction occurs yearly when millions of gametes are expelled into the current. Each polyp is hermaphroditic, releasing both eggs and sperm.

The habitat needs of nearshore marine invertebrates include saltwater habitats with rocks, boulders, and sand channels. Coral species rely on algae for the byproducts of photosynthesis. Because marine species spend their lives in the aquatic environment, they need unpolluted, suitable water quality.

Of the 17 nearshore marine invertebrates, 2 are endangered and 15 are threatened. Critical habitat has been designated for four species.

The following representative threats to nearshore marine invertebrates have been synthesized from information available for several species:

- Overfishing and illegal take;
- Disease, such as the withering syndrome;

- Coral bleaching;[19] and
- Habitat destruction.

### 4.10.5 Beach Invertebrates

Information on beach invertebrates has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1994g) (U.S. Fish and Wildlife Service, 1998h) (U.S. Fish and Wildlife Service, 2003e) (U.S. Fish and Wildlife Service, 2008b). Beach invertebrates include snails and insects (beetles, butterflies, and flies).

Beach invertebrates may exhibit cryptic coloration and small size. Population sizes may fluctuate widely from year to year. Beach species are sensitive to habitat fragmentation, which can cause inbreeding and isolated population pockets. All beach invertebrates utilize the beach dune habitat.

Snails inhabit coastal scrub communities, typified with many low-lying branches touching the ground. Snails may be specific to coastal scrub, maritime chaparral, or may range across both. Beetles use shallow burrows in the mid- to above-high tide drift zone, often with the female inside the burrow and the male guarding the mouth. Beetles are often found near the water's edge on sunny days, hunting, mating, and basking for thermoregulation. Beach species of butterfly have specific host plants endemic to beach dunes, such as the early blue violet, and are often dependent on specific plants through each life stage. Flies are generally found in dune systems of inland desert valleys, rivers, deltas, and beach strands.

It is assumed that coastal snails feed on fungus from decaying plant matter. Beetles are predatory, preying upon smaller invertebrates. Butterflies are typically dependent on specific plants: a larval host plant and a nectar plant for feeding when an adult. Very little is known about beach flies, but the positioning of eggs near ant nests may indicate a possible food source for larvae. Adults generally feed on nectar of dune plants, but it is unknown if nectar is a primary food source.

Little is known about coastal snail reproduction, other than that sarcophagid flies parasitize the snail, and mortality often occurs before the larvae reach adulthood. Beetles lay eggs in burrows, and larvae often plug the burrow mouth with sand during high tide. Larvae may relocate to a more favorable location and dig a new burrow. Butterfly eggs are laid in the debris and dried stems of the host plant. Overwintering occurs in diapause, and the adult flight stage generally lasts only a few weeks. Flies lay eggs in loose sand during late summer, larvae develop underground, and adults emerge in July through September. Flight stages may begin as early as July, with adults being most active on warm, sunny days.

Of the eight beach invertebrates, six are endangered and two are threatened. Critical habitat has been designated for two species.

The following representative threats to beach invertebrates have been synthesized from information available for several species:

- Loss of habitat due to development and agriculture;
- Alteration of flora due to intrusion of non-native species;
- Habitat fragmentation;

[19] Warmer water temperatures can result in coral bleaching as when water is too warm, corals can release the algae living in their tissues turning the corals white.

- Changes in natural fire regimes and succession, including overgrowth;
- Destruction of sand dunes; and
- Beach nourishment activities.

### 4.10.6 Barren Land Invertebrates

Information on barren land invertebrates has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1984h) (U.S. Fish and Wildlife Service, 1998i) (U.S. Fish and Wildlife Service, 2002b) (Lockwood & Lockwood, 2008) (Santa Barbara Museum of Natural History, 2009) (U.S. Fish and Wildlife Service, 2011a) (U.S. Fish and Wildlife Service, 2013g). Barren land invertebrates include snails and insects (beetles, butterflies, flies, and grasshoppers).

Snail species are generally found near rock cracks and fissures or between boulders, where air can circulate through the leaf litter and damp shaded areas between rocks. Insects are found in sandhills, alluvial fans, alkali flats, volcanic rock, and other varied habitats.

Snails are largely herbivores feeding on leaves and other forage, although some species are opportunistic feeders, scavenging and feeding on detritus. A few species of terrestrial snails are predatory. Beetles are either herbivorous (scarab beetles) or predatory (tiger beetles). Tiger beetles prey on smaller invertebrates. Butterflies and moths are typically dependent on specific host plants. Larvae generally feed on the leaves, stems, and flowers, whereas the adult feeds on nectar. While the larvae are typically plant-specific, adults may not be. Grasshoppers are herbivorous. While some grasshoppers are restricted to feeding on one specific plant, others are non-specific.

Most snails are hermaphroditic, but do not self-fertilize. There is typically a definite breeding season, and multiple egg clutches from during the breeding season is not uncommon. Beetles emerge from burrows one to two months during the summer; eggs are laid in the bottom of burrows, and adults die a short time later. Butterflies lay eggs at the base of the host plant. Most grasshoppers have one cache of eggs per year laying eggs in clusters ranging from very small in number (3) to large in number (up to 200). Eggs are laid in the soil in late fall or early winter, hatching between May and August.

The habitat needs of barren land invertebrates include arid areas such as boulders, volcanic rock, and sandhills, with damp, shaded areas in between. These species rely on a variety of food sources, but require some vegetation, whether for leaves and stems, or the detritus.

Of the 20 barren land invertebrates, 17 are endangered, and 3 are threatened. Critical habitat has been designated for 14 species.

The following representative threats to barren land invertebrates been synthesized from information available for several species:

- Habitat destruction and fragmentation due to urban and agricultural development;
- Alteration of flora and increased predation due to intrusion of non-native species;
- Sand mining;
- Pesticide and bio-control agents, especially for mosquitos; and
- Changes in natural fire regimes and succession.

### 4.10.7 Cave Invertebrates

Information on cave invertebrates has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 2006d) (U.S. Fish and Wildlife Service, 2008c) (U.S. Fish and Wildlife Service, 1988). Cave invertebrates include crustaceans, insects (beetles) and arachnids. These species are found in subterranean cave systems with groundwater our underwater springs or streams, karst cave formations, or lava formations. Certain features, such as eyes and wings, may have become vestigial in cave invertebrates.

Cave crustaceans are detritivores that feed on plant roots and rotting plant material and fecal matter of other organisms. Beetles primarily feed on fungus, microbes, and smaller invertebrates. Arachnids are primarily predators; prey is generally smaller crustaceans, insects, and arachnids.

Very little is known of the reproductive habits of cave crustaceans. Insects utilize low metabolic and reproductive rates; therefore, reproductive rates are very low, and individuals are believed to have a longer life span. Arachnids are dimorphic, and courtship is generally a complicated process. Eggs are typically deposited into a protected site and no further care is given.

The habitat needs of cave invertebrates include adequate water sources, such as groundwater or underwater springs, within the caves. These species often need vegetation as well, whether as a direct food source or as a food source that supports prey populations.

Of the 27 cave invertebrates, 26 are endangered, one is threatened, and critical habitat has been designated for 14 species.

The following representative threats to cave invertebrates have been synthesized from information available for several species:

- Habitat destruction through fill or quarry;
- Habitat degradation due to aquifer depletion;
- Excessive human visitation; and
- Predation and/or competition from invasive species.

### 4.10.8 Rangeland Invertebrates

Information on rangeland invertebrates has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 2001b) (U.S. Fish and Wildlife Service, 2003a) (U.S. Fish and Wildlife Service, 2014a).

Rangeland invertebrates consist of beetles, butterflies, and moths that use open upland habitats dominated by grasses, shrubs, and herbaceous growth that lack trees. These habitats include the herbaceous, shrub and brush, and mixed rangeland habitat types.

Beetles are fossorial and found in herbaceous rangeland areas. Most of the butterflies and moths have particular flowering host plants. Host plants for these species often require an open canopy and dry soils.

Beetles are predatory or carrion scavengers. Predatory beetles feed mainly on other insects. Butterflies and moths are herbivorous. Butterfly and moth larvae generally feed on the leaves, stems, and flowers, whereas the adults feed on nectar. While the larvae are typically plant-specific, adults may not be.

Beetles lay eggs in a small tunnel, and after hatching enlarge the tunnel into a burrow. Beetle larvae go through several instars, requiring several years to reach adulthood. Adult beetles emerge from the burrow and reproduction typically begins immediately. Beetles are highly habitat-specific due to the limited egg and larvae range of tolerance for soil moisture, composition,

and temperature. Butterflies and moths lay eggs on the stalk or in the debris of the larval host plant. During the first year, butterflies often enter a period of suspended growth, or diapause, as eggs and again as larvae. It is believed that additional periods of diapause may be undertaken during periods of unfavorable conditions. As adults, butterflies generally do not survive more than one to two weeks.

The habitat needs of rangeland invertebrates include open areas without trees, particularly as they rely on certain plant species that may only grow in open environments with plenty of sunshine. The beetles require undisturbed areas of soil, to nest and lay eggs in burrows.

Of the 15 rangeland invertebrate species, 13 are endangered and 2 are threatened. Critical habitat has been designated for six species.

The following representative threats to rangeland invertebrates have been synthesized from information available for several species:

- Loss or modification of habitat from urban development and recreational use;
- Farming and ranching practices (pesticide use, grazing/trampling of habitat);
- Illegal collection and trade;
- Lack of natural succession regime; and
- Reduction of host plants due to competition with non-native plants.

### 4.10.9 Forest Land Invertebrates

Information on forest land invertebrates has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1984f) (U.S. Fish and Wildlife Service, 2001a) (U.S. Fish and Wildlife Service, 2005b) (U.S. Fish and Wildlife Service, 2015m) (U.S. Fish and Wildlife Service, 2014p).

Forest land invertebrates include snails, insects (butterflies and moths), and arachnids that occupy upland forested areas dominated by deciduous or evergreen trees, or a combination of both.

Snails rely on ferns and other forest undergrowth as well as fallen leaf litter resulting from the forest canopy. Butterflies and moths require a host plant only found in the mesic forest, generally reliant on specific host plants for the larval and adult stages. Arachnids are restricted to rocky outcrops in a spruce-dominated forest.

Forest land snails are believed to graze on fungal mycelia, and may hibernate during winter. Butterflies and moths are herbivorous and may feed on only one or a narrowly defined group of plants. Arachnids are predatory, and feed on smaller invertebrates.

Nearly all terrestrial snails are hermaphrodites, though little is known about the reproduction of listed forest land snails. Some forest land moths and butterflies will brood twice in one year, with one set of eggs hatching during the active portion of the year, and the other overwintering. Little is known about the habits of the listed arachnid.

The habitat needs of forest land invertebrates include trees or adequate canopy cover, leaf litter, and forest undergrowth for shelter. The butterflies and moths rely on specific host plants.

Of the 10 forest land invertebrate species, 2 are endangered, 2 are threatened, and 6 are proposed endangered. Critical habitat has been designated for two species.

The following representative threats to forest land invertebrates have been synthesized from information available for several species:

- Habitat loss due to forest fires and activities such as slope clearing, pasturing, agriculture, ORVs, development, and road building;
- Alteration of flora due to intrusion of non-native species;
- Increased predation pressure due to creation of edge habitat creation from clearing activities; and
- Illegal collection and trade.

Table 4-8 lists all U.S. invertebrates, by sub-group, which are listed or proposed threatened or endangered, the State(s) in which they are found, and whether critical habitat has been designated for the species.

**Table 4-8: Threatened and Endangered Invertebrates in the U.S.**

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Forested Wetland Invertebrates – Occur in the Action Area | | | | |
| Oahu tree snails | *Achatinella spp.* | E | HI | No |
| Florida leafwing butterfly | *Anaea troglodyta floridalis* | E | FL | Yes |
| Painted snake coiled forest snail | *Anguispira picta* | T | TN | No |
| Salt Creek tiger beetle | *Cicindela nevadica lincolniana* | E | NE | Yes |
| Miami blue butterfly | *Cyclargus (=Hemiargus) thomasi bethunebakeri* | E | FL | No |
| Valley elderberry longhorn beetle | *Desmocerus californicus dimorphus* | T | CA | Yes |
| Hawaiian picture-wing fly | *Drosophila digressa* | E | HI | No |
| Hawaiian picture-wing fly | *Drosophila sharpi* | E | HI | Yes |
| Schaus swallowtail butterfly | *Heraclides aristodemus ponceanus* | E | FL | No |
| Lotis blue butterfly | *Lycaeides argyrognomon lotis* | E | CA | No |
| Flying earwig Hawaiian damselfly | *Megalagrion nesiotes* | E | HI | No |
| Saint Francis' satyr butterfly | *Neonympha mitchellii francisci* | E | NC | No |
| Mitchell's satyr butterfly | *Neonympha mitchellii* | E | AL, IN, MI, MS, OH, VA | No |
| Newcomb's tree snail | *Newcombia cumingi* | E | HI | No |
| Stock Island tree snail | *Orthalicus reses (not incl. nesodryas)* | T | FL | No |
| Lanai tree snail | *Partulina semicarinata* | E | HI | No |
| Lanai tree snail | *Partulina variabilis* | E | HI | No |
| Bartram's hairstreak butterfly | *Strymon acis bartrami* | E | FL | Yes |
| Chittenango ovate amber snail | *Succinea chittenangoensis* | T | NY | No |
| Nonforested Wetland Invertebrates – Occur in the Action Area | | | | |
| Conservancy fairy shrimp | *Branchinecta conservatio* | E | CA | Yes |
| Longhorn fairy shrimp | *Branchinecta longiantenna* | E | CA | Yes |
| Vernal pool fairy shrimp | *Branchinecta lynchi* | T | CA, OR | Yes |
| San Diego fairy shrimp | *Branchinecta sandiegonensis* | E | CA | Yes |
| Delta green ground beetle | *Elaphrus viridis* | T | CA | Yes |
| Vernal pool tadpole shrimp | *Lepidurus packardi* | E | CA | Yes |
| Kanab ambersnail | *Oxyloma haydeni kanabensis* | E | AZ, UT | No |
| Virginia fringed mountain snail | *Polygyriscus virginianus* | E | VA | No |
| Hine's emerald dragonfly | *Somatochlora hineana* | E | IL, MI, MO, WI | Yes |
| Riverside fairy shrimp | *Streptocephalus woottoni* | E | CA | Yes |
| Freshwater Invertebrates – Occur in the Action Area | | | | |
| Cumberland elktoe | *Alasmidonta atropurpurea* | E | KY, TN | Yes |
| Dwarf wedgemussel | *Alasmidonta heterodon* | E | CT, MA, MD, NC, NH, NJ, NY, PA, VA, VT | No |
| Appalachian elktoe | *Alasmidonta raveneliana* | E | NC, TN | Yes |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Fat threeridge (mussel) | *Amblema neislerii* | E | FL, GA | Yes |
| Ash Meadows naucorid | *Ambrysus amargosus* | T | NV | Yes |
| Tumbling Creek cavesnail | *Antrobia culveri* | E | MO | Yes |
| Ouachita rock pocketbook | *Arkansia wheeleri* | E | AR, OK | No |
| Pecos assiminea snail | *Assiminea pecos* | E | NM, TX | Yes |
| Hungerford's crawling water beetle | *Brychius hungerfordi* | E | MI | No |
| Big Sandy crayfish | *Cambarus callainus* | PE | KY, VA, WV | No |
| Big Sandy crayfish (or Guyandotte River crayfish) | *Cambarus veteranus* | PE | KY, VA, WV | No |
| Slender campeloma | *Campeloma decampi* | E | AL | No |
| Spectaclecase (mussel) | *Cumberlandia monodonta* | E | AL, AR, IA, IL, KS, KY, MN, MO, TN, VA, WI, WV | No |
| Fanshell | *Cyprogenia stegaria* | E | AL, IL, IN, KY, OH, TN, VA, WV | No |
| Dromedary pearlymussel | *Dromus dromas* | E | AL, KY, TN, VA | No |
| Lacy elimia (snail) | *Elimia crenatella* | T | AL | No |
| Chipola slabshell | *Elliptio chipolaensis* | T | AL, FL | Yes |
| Altamaha Spinymussel | *Elliptio spinosa* | E | GA | Yes |
| Tar River spinymussel | *Elliptio steinstansana* | E | NC | No |
| Purple bankclimber (mussel) | *Elliptoideus sloatianus* | T | AL, FL, GA | Yes |
| Cumberlandian combshell | *Epioblasma brevidens* | E | AL, KY, MS, TN, VA | Yes |
| Oyster mussel | *Epioblasma capsaeformis* | E | AL, KY, TN, VA | Yes |
| Curtis pearlymussel | *Epioblasma florentina curtisii* | E | AR, MO | No |
| Yellow blossom (pearlymussel) | *Epioblasma florentina* | E | AL, TN | No |
| Tan riffleshell | *Epioblasma florentina walkeri (=E. walkeri)* | E | KY, TN, VA | No |
| Upland combshell | *Epioblasma metastriata* | E | AL, TN | Yes |
| Purple cat's paw (=Purple cat's paw pearlymussel) | *Epioblasma obliquata* | E | AL, KY, OH, TN | No |
| White catspaw (pearlymussel) | *Epioblasma obliquata perobliqua* | E | IN, OH | No |
| Southern acornshell | *Epioblasma othcaloognesis* | E | AL, TN | Yes |
| Southern combshell (penitent mussel) | *Epioblasma penita* | E | AL, MS | No |
| Green blossom (pearlymussel) | *Epioblasma torulosa gubernaculum* | E | TN, VA | No |
| Northern riffleshell | *Epioblasma torulosa rangiana* | E | IN, KY, MI, OH, PA, WV | No |
| Tubercled blossom (pearlymussel) | *Epioblasma torulosa* | E | KY, TN, WV | No |
| Snuffbox mussel | *Epioblasma triquetra* | E | AL, AR, IL, IN, KY, MI, MN, MO, MS, OH, PA, TN, VA, WI, WV | No |
| Turgid blossom (pearlymussel) | *Epioblasma turgidula* | E | AL, AR, TN | No |
| Newcomb's snail | *Erinna newcombi* | T | HI | Yes |
| Tapered pigtoe | *Fusconaia burkei* | T | AL, FL | Yes |
| Shiny pigtoe | *Fusconaia cor* | E | AL, TN, VA | No |
| Finerayed pigtoe | *Fusconaia cuneolus* | E | AL, TN, VA | No |
| Narrow pigtoe | *Fusconaia escambia* | T | AL, FL | Yes |
| Round ebonyshell | *Fusconaia rotulata* | E | AL, FL | Yes |
| Noel's amphipod | *Gammarus desperatus* | E | NM | Yes |
| Diminutive amphipod | *Gammarus hyalleloides* | E | TX | Yes |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Pecos amphipod | *Gammarus pecos* | E | TX | Yes |
| Southern sandshell | *Hamiota australis* | T | AL, FL | Yes |
| Cracking pearlymussel | *Hemistena lata* | E | AL, KY, TN, VA | No |
| Rota blue damselfly | *Ischnura luta* | PE | NMI | No |
| Koster's springsnail | *Juturnia kosteri* | E | NM | Yes |
| Birdwing pearlymussel | *Lemiox rimosus* | E | TN, VA | No |
| Pink mucket (pearlymussel) | *Lampsilis abrupta* | E | AL, AR, IL, KY, LA, MO, OH, TN, VA, WV | No |
| Finelined pocketbook | *Lampsilis altilis* | T | AL, GA, TN | Yes |
| Higgins eye (pearlymussel) | *Lampsilis higginsii* | E | IA, IL, MN, MO, SD, WI | No |
| Orangenacre mucket | *Lampsilis perovalis* | T | AL, MS | Yes |
| Arkansas fatmucket | *Lampsilis powellii* | T | AR | No |
| Neosho mucket | *Lampsilis rafinesqueana* | E | AR, KS, MO, OK | No |
| Speckled pocketbook | *Lampsilis streckeri* | E | AR | No |
| Shinyrayed pocketbook | *Lampsilis subangulata* | E | AL, FL, GA | Yes |
| Alabama lampmussel | *Lampsilis virescens* | E | AL, TN | No |
| Banbury Springs limpet | *Lanx sp.* | E | ID | No |
| Carolina heelsplitter | *Lasmigona decorata* | T | NC, SC | Yes |
| Scaleshell mussel | *Leptodea leptodon* | E | AR, MO, NE, OK, SD | No |
| Round rocksnail | *Leptoxis ampla* | T | AL | No |
| Interrupted (=Georgia) rocksnail | *Leptoxis forman* | E | AL, GA | Yes |
| Plicate rocksnail | *Leptoxis plicata* | E | AL | No |
| Painted rocksnail | *Leptoxis taeniata* | T | AL | No |
| Flat pebblesnail | *Lepyrium showalteri* | E | AL | No |
| Cylindrical lioplax (snail) | *Lioplax cyclostomaformis* | E | AL | No |
| Louisiana pearlshell | *Margaritifera hembeli* | T | LA | No |
| Alabama pearlshell | *Margaritifera marrianae* | E | AL | Yes |
| Alabama moccasinshell | *Medionidus acutissimus* | T | AL, GA, MS | Yes |
| Coosa moccasinshell | *Medionidus parvulus* | E | AL, GA, TN | Yes |
| Gulf moccasinshell | *Medionidus penicillatus* | E | AL, FL, GA | Yes |
| Ochlockonee moccasinshell | *Medionidus simpsonianus* | E | FL, GA | Yes |
| Crimson Hawaiian damselfly | *Megalagrion leptodemas* | E | HI | Yes |
| Blackline Hawaiian damselfly | *Megalagrion nigrohamatum nigrolineatum* | E | HI | Yes |
| Oceanic Hawaiian damselfly | *Megalagrion oceanicum* | E | HI | Yes |
| Pacific Hawaiian damselfly | *Megalagrion pacificum* | E | HI | No |
| Ring pink (mussel) | *Obovaria retusa* | E | AL, KY, TN | No |
| Nashville crayfish | *Orconectes shoupi* | E | TN | No |
| Shasta crayfish | *Pacifastacus fortis* | E | CA, OR | No |
| Squirrel Chimney Cave shrimp | *Palaemonetes cummingi* | T | FL | No |
| Littlewing pearlymussel | *Pegias fabula* | E | AL, KY, NC, TN, VA | No |
| Snake River physa snail | *Physa natricina* | E | ID | No |
| White wartyback (pearlymussel) | *Plethobasus cicatricosus* | E | AL, KY, TN | No |
| Orangefoot pimpleback (pearlymussel) | *Plethobasus cooperianus* | E | AL, IL, KY, TN | No |
| Sheepnose mussel | *Plethobasus cyphyus* | E | AL, IA, IL, IN, KY, MN, MO, MS, OH, PA, TN, VA, WI, WV | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Clubshell | *Pleurobema clava* | E | IL, IN, KY, MI, NY, OH, PA, TN, WV | No |
| James spinymussel | *Pleurobema collina* | E | NC, VA, WV | No |
| Black clubshell | *Pleurobema curtum* | E | MS | No |
| Southern clubshell | *Pleurobema decisum* | E | AL, GA, MS | Yes |
| Dark pigtoe | *Pleurobema furvum* | E | AL | Yes |
| Cumberland pigtoe | *Pleurobema gibberum* | E | TN | No |
| Southern pigtoe | *Pleurobema georgianum* | E | AL, GA, TN | Yes |
| Georgia pigtoe | *Pleurobema hanleyianum* | E | AL, GA, TN | Yes |
| Flat pigtoe (Marshall's pearly mussel) | *Pleurobema marshalli* | E | AL, MS | No |
| Ovate clubshell | *Pleurobema perovatum* | E | AL, MS, TN | Yes |
| Rough pigtoe | *Pleurobema plenum* | E | AL, IN, KY, TN, VA | No |
| Oval pigtoe | *Pleurobema pyriforme* | E | AL, FL, GA | Yes |
| Fuzzy pigtoe | *Pleurobema strodeanum* | T | AL, FL | Yes |
| Heavy pigtoe (Judge Tait's mussel) | *Pleurobema taitianum* | E | AL | No |
| Rough hornsnail | *Pleurocera foreman* | E | AL | Yes |
| Slabside pearlymussel | *Pleuronaia dolabelloides* | E | AL, KY, MS, TN, VA | Yes |
| Fat pocketbook | *Potamilus capax* | E | AR, IL, IN, KY, LA, MO, MS | No |
| Alabama (=inflated) heelsplitter | *Potamilus inflatus* | T | AL, LA, MS | No |
| Diamond tryonia | *Pseudotryonia adamantina* | E | TX | Yes |
| Triangular kidneyshell | *Ptychobranchus greenii* | E | AL, GA, TN | Yes |
| Southern kidneyshell | *Ptychobranchus jonesi* | E | AL, FL | Yes |
| Fluted kidneyshell | *Ptychobranchus subtentum* | E | KY, TN, VA | Yes |
| San Bernardino springsnail | *Pyrgulopsis bernardina* | T | AZ | Yes |
| Bruneau hot springsnail | *Pyrgulopsis bruneauensis* | E | ID | No |
| Chupadera springsnail | *Pyrgulopsis chupaderae* | E | NM | Yes |
| Socorro springsnail | *Pyrgulopsis neomexicana* | E | NM | No |
| Royal marstonia (snail) | *Pyrgulopsis ogmorhaphe* | E | TN | No |
| Armored snail | *Pyrgulopsis (=Marstonia) pachyta* | E | AL | No |
| Roswell springsnail | *Pyrgulopsis roswellensis* | E | NM | Yes |
| Phantom springsnail | *Pyrgulopsis texana* | E | TX | Yes |
| Three Forks springsnail | *Pyrgulopsis trivialis* | E | AZ | Yes |
| Rabbitsfoot | *Quadrula cylindrica* | T | AL, AR, IL, IN, KS, KY, LA, MO, MS, OH, OK, PA, TN | No |
| Rough rabbitsfoot | *Quadrula cylindrica strigillata* | E | TN, VA | Yes |
| Winged mapleleaf | *Quadrula fragosa* | E | AR, MN, MO, OK, WI | No |
| Cumberland monkeyface (pearlymussel) | *Quadrula intermedia* | E | AL, TN, VA | No |
| Appalachian monkeyface (pearlymussel) | *Quadrula sparsa* | E | TN, VA | No |
| Stirrupshell | *Quadrula stapes* | E | AL, MS | No |
| Hay's Spring amphipod | *Stygobromus hayi* | E | DC, MD | No |
| Peck's cave amphipod | *Stygobromus (=Stygonectes) pecki* | E | TX | Yes |
| California freshwater shrimp | *Syncaris pacifica* | E | CA | No |
| Bliss Rapids snail | *Taylorconcha serpenticola* | T | ID | No |
| Socorro isopod | *Thermosphaeroma thermophilus* | E | NM | No |
| Pale lilliput (pearlymussel) | *Toxolasma cylindrellus* | E | AL, TN | No |
| Gonzales tryonia | *Tryonia circumstriata (=stocktonensis)* | E | TX | Yes |
| Phantom Tryonia | *Tryonia cheatumi* | E | TX | Yes |
| Tulotoma snail | *Tulotoma magnifica* | T | AL | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Rayed bean | *Villosa fabalis* | E | IN, MI, NY, OH, PA, VA | No |
| Purple bean | *Villosa perpurpurea* | E | TN, VA | Yes |
| Cumberland bean (pearlymussel) | *Villosa trabalis* | E | AL, KY, NC, TN, VA | No |
| Nearshore Marine Invertebrates – Occur in the Action Area | | | | |
| Black abalone | *Haliotis cracherodii* | E | CA | Yes |
| White abalone | *Haliotis sorenseni* | E | CA | No |
| Coral [no common name] | *Acropora globiceps* | T | GU, NMI, AS | No |
| Coral [no common name] | *Acropora jacquelineae* | T | AS | No |
| Coral [no common name] | *Acropora retusa* | T | GU, NMI, AS | No |
| Coral [no common name] | *Acropora rudis* | T | AS | No |
| Coral [no common name] | *Acropora speciosa* | T | AS | No |
| Coral [no common name] | *Acropora paradivisa* | T | AS | No |
| Coral [no common name] | *Acropora crateriformis* | T | AS | No |
| Coral [no common name | *Acropora aculeata* | T | GU, NMI | No |
| Boulder star coral | *Orbicella franksi* | T | FL, PR, VI | No |
| Elkhorn coral | *Acropora palmata* | T | FL, PR, VI | Yes |
| Lobed star coral | *Orbicella annularis* | T | FL, PR, VI | No |
| Mountainous star coral | *Orbicella faveolata* | T | FL, PR, VI | No |
| Pillar coral | *Dendroygyra cylindrus* | T | FL | No |
| Staghorn coral | *Acropora cervicornis* | T | FL, PR, VI | Yes |
| Beach Invertebrates – Occur in the Action Area | | | | |
| Lange's metalmark butterfly | *Apodemia mormo langei* | E | CA | No |
| Northeastern beach tiger beetle | *Cicindela dorsalis* | T | MA, MD, NJ, VA | No |
| El Segundo blue butterfly | *Euphilotes battoides allyni* | E | CA | No |
| Morro shoulderband (=Banded dune) snail | *Helminthoglypta walkeriana* | E | CA | Yes |
| Delhi Sands flower-loving fly | *Rhaphiomidas terminatus abdominalis* | E | CA | No |
| Behren's silverspot butterfly | *Speyeria zerene behrensii* | E | CA | No |
| Oregon silverspot butterfly | *Speyeria zerene hippolyta* | T | CA, OR | Yes |
| Myrtle's silverspot butterfly | *Speyeria zerene myrtleae* | E | CA | No |
| Barren Land Invertebrates – Occur in the Action Area | | | | |
| Uncompahgre fritillary butterfly | *Boloria acrocnema* | E | CO | No |
| Puritan tiger beetle | *Cicindela puritana* | T | CT, MA, MD | No |
| Casey's June beetle | *Dinacoma caseyi* | E | CA | Yes |
| Iowa Pleistocene snail | *Discus macclintocki* | E | IA, IL | No |
| [Unnamed] pomace fly | *Drosophila aglaia* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila differens* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila hemipeza* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila heteroneura* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila montgomeryi* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila mulli* | T | HI | Yes |
| [Unnamed] pomace fly | *Drosophila musaphilia* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila neoclavisetae* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila obatai* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila ochrobasis* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila substenoptera* | E | HI | Yes |
| [Unnamed] pomace fly | *Drosophila tarphytrichia* | E | HI | Yes |
| Mount Hermon June beetle | *Polyphylla barbata* | E | CA | No |
| Carson wandering skipper | *Pseudocopaeodes eunus obscurus* | E | CA, NV | No |
| Zayante band-winged grasshopper | *Trimerotropis infantilis* | E | CA | Yes |
| Flat-spired three-toothed snail | *Triodopsis platysayoides* | T | WV | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Cave Invertebrates – Occur in the Action Area | | | | |
| Kauai cave wolf or pe'e maka 'ole spider | *Adelocosa anops* | E | HI | Yes |
| Madison Cave isopod | *Antrolana lira* | T | VA, WV | No |
| Coffin Cave mold beetle | *Batrisodes texanus* | E | TX | No |
| Helotes mold beetle | *Batrisodes venyivi* | E | TX | Yes |
| Cave crayfish | *Cambarus aculabrum* | E | AR, MO | No |
| Cave crayfish | *Cambarus zophonastes* | E | AR | No |
| Robber Baron Cave meshweaver | *Cicurina baronia* | E | TX | Yes |
| Madla's Cave meshweaver | *Cicurina madla* | E | TX | Yes |
| Braken Bat Cave meshweaver | *Cicurina venii* | E | TX | Yes |
| Government Canyon Bat Cave meshweaver | *Cicurina vespera* | E | TX | Yes |
| Illinois cave amphipod | *Gammarus acherondytes* | E | IL | No |
| Comal Springs riffle beetle | *Heterelmis comalensis* | E | TX | Yes |
| Tooth Cave spider | *Leptoneta myopica* | E | TX | No |
| Lee County cave isopod | *Lirceus usdagalun* | E | VA | No |
| Government Canyon Bat Cave spider | *Neoleptoneta microps* | E | TX | Yes |
| Alabama cave shrimp | *Palaemonias alabamae* | E | AL | No |
| Kentucky cave shrimp | *Palaemonias ganteri* | E | KY | Yes |
| [no common name] beetle | *Rhadine exilis* | E | TX | Yes |
| [no common name] beetle | *Rhadine infernalis* | E | TX | Yes |
| Tooth Cave ground beetle | *Rhadine persephone* | E | TX | No |
| Kauai cave amphipod | *Spelaeorchestia koloana* | E | HI | Yes |
| Comal Springs dryopid beetle | *Stygoparnus comalensis* | E | TX | Yes |
| Tooth Cave pseudoscorpion | *Tartarocreagris texana* | E | TX | No |
| Cokendolpher Cave harvestman | *Texella cokendolpheri* | E | TX | Yes |
| Bee Creek Cave harvestman | *Texella reddelli* | E | TX | No |
| Bone Cave harvestman | *Texella reyesi* | E | TX | No |
| Kretschmarr Cave mold beetle | *Texamaurops reddelli* | E | TX | No |
| Rangeland Invertebrates – Occur in the Action Area | | | | |
| San Bruno elfin butterfly | *Callophrys mossii bayensis* | E | CA | No |
| Ohlone tiger beetle | *Cicindela ohlone* | E | CA | No |
| Smith's blue butterfly | *Euphilotes enoptes smithi* | E | CA | No |
| bay checkerspot butterfly | *Euphydryas editha bayensis* | T | CA | Yes |
| Quino checkerspot butterfly | *Euphydryas editha quino (=E. e. wrighti)* | E | CA | Yes |
| Taylor's (=whulge) checkerspot | *Euphydryas editha taylori* | E | OR, WA | Yes |
| Kern primrose sphinx moth | *Euproserpinus euterpe* | T | CA | No |
| Palos Verdes blue butterfly | *Glaucopsyche lygdamus palosverdesensis* | E | CA | Yes |
| Fender's blue butterfly | *Icaricia icarioides fenderi* | E | OR | Yes |
| Mission blue butterfly | *Icaricia icarioides missionensis* | E | CA | No |
| Karner blue butterfly | *Lycaeides melissa samuelis* | E | IL, IN, MI, MN, NH, NY, OH, WI | No |
| American burying beetle | *Nicrophorus americanus* | E | AR, KS, MA, MO, NE, OH, OK, RI, SD, TX | No |
| Mount Charleston blue butterfly | *Plebejus shasta charlestonensis* | E | NA | No |
| Laguna Mountains skipper | *Pyrgus ruralis lagunae* | E | CA | Yes |
| callippe silverspot butterfly | *Speyeria callippe* | E | CA | No |
| Forest Land Invertebrates – Occur in the Action Area | | | | |
| Pawnee montane skipper | *Hesperia leonardus montana* | T | CO | No |
| Mariana eight-spot butterfly | *Hypolimnas mariannensis* | PE | GU, NMI | No |
| Blackburn's sphinx moth | *Manduca blackburni* | E | HI | Yes |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Spruce-fir moss spider | *Microhexura montivaga* | E | NC, TN, VA | Yes |
| Guam tree snail | *Partula radiolata* | PE | GU | No |
| Humped tree snail | *Partula gibba* | PE | NMI | No |
| Langford's tree snail | *Partula langfordi* | PE | NMI | No |
| Noonday globe | *Patera clarki nantahala* | T | NC | No |
| Fragile tree snail | *Samoana fragilis* | PE | GU, NMI | No |
| Mariana wandering butterfly | *Vagrans egistina* | PE | GU, NMI | No |
| Source: (U.S. Fish and Wildlife Service, 2014m)<br>E = Endangered; T = Threatened; PE = Proposed Endangered; PT = Proposed Threatened | | | | |

## 4.11 Plants

Plants include any member of the kingdom Plantae, comprising multicellular organisms that typically produce their own food from inorganic matter by the process of photosynthesis and that have relatively rigid cell walls containing cellulose. Plants not only occupy specific habitats, they define the characteristics of those habitats. Plants have been placed into eight sub-groups: forested wetland plants, nonforested wetland plants, freshwater plants, nearshore marine plants, beach plants, inland sandy area plants, rangeland plants, and forest land plants. USFWS has jurisdiction over all threatened and endangered plants, with the exception of one marine species that is under the jurisdiction of NMFS.

The plant species group includes a wide array of taxa, including trees, shrubs, grasses, ferns, lichen, and flowering plants. While all plant species are capable of reproducing sexually, some species also can reproduce clonally through fragmentation, the production of spores, or through specialized structures such as rhizomes or bulbs. In conifers and flowering plants, sexual reproduction occurs through pollination, which can occur either via wind-borne pollen or with the assistance of pollinators, such as bees and other insects, hummingbirds, and bats. Plants disperse their seeds through a variety of means, including gravity, wind, animals (both through ingestion or external attachment), and water. The distribution of individual species within the sub-groups is defined by climate, soil types, elevation, aspect, and other physical parameters. Many of the species in this group are endemic to small and geographically isolated areas.

### 4.11.1 Forested Wetland Plants

Information on forested wetland plants has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, Region 3, 1983) (U.S. Fish and Wildlife Service, 1991c) (U.S. Fish and Wildlife Service, 1993f) (U.S. Fish and Wildlife Service, 1994f) (U.S. Fish and Wildlife Service, 1999c) (U.S. Fish and Wildlife Service, 2013k).

Forested wetlands have canopies of deciduous, evergreen, or coniferous trees above a variety of flowering annual and perennial plants, grasses, and flowering shrubs. Forested wetlands and occur in areas that are seasonally flooded, as well as perennially wet areas. Riparian forests along the borders of waterways are typically included within this sub-group. Forested wetlands also occur along coastal margins (e.g., mangrove swamps). Forested wetland plants are generally tolerant of or require saturated soils and cannot tolerate drought conditions.

The habitat needs of forested wetland plants vary depending on the species, but may include access to standing water, near surface groundwater, or seasonally saturated waters; a suitable overstory of trees; protection from overgrazing by native and non-native species; freedom from competition with invasive, non-native plants; and protection from excessive trampling or ground disturbance.

Of the 85 forested wetland plants, 72 are endangered and 13 are threatened. Critical habitat has been designated for 39 listed species.

The following representative threats to forested wetland plants have been synthesized from information available for several species:

- Inundation of habitat through the construction of dams and other impoundments;
- Habitat modification due to diversion and channelization of waterways and groundwater extraction;
- Collection of plants for horticulture;
- Habitat loss as a result of urbanization, agricultural conversion, and mining;
- Erosion and sedimentation from nearby agricultural and construction activities;
- Introduction of invasive plant species which compete for resources;
- Introduction of plant-eating animals such as goats, pigs, slugs, and rats;
- Grazing practices that are incompatible with the persistence of native flora;
- Off-highway vehicle use; and
- Alteration of fire regime.

### 4.11.2 Nonforested Wetland Plants

Information on nonforested wetland plants has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1990e) (U.S. Fish and Wildlife Service, 1997e) (U.S. Fish and Wildlife Service, 1998a) (U.S. Fish and Wildlife Service, 1999a) (U.S. Fish and Wildlife Service, 2005a).

Nonforested wetlands are dominated by grasses, forbs, sedges, rushes, and other herbaceous vegetation. Nonforested wetlands occur along estuaries and the shorelines of lakes and waterways, and in upland areas with poor drainage. Nonforested wetland plants are generally tolerant of or require saturated soils; some species are adapted to perennially wet areas, tidal areas, or vernal pools and other seasonally wet areas.

The habitat needs of nonforested wetland plants vary depending on the species, but may include: access to standing water, near surface groundwater, or seasonally saturated waters; a level of inundation or disturbance regime that prevents the establishment of shrubs and trees; protection from overgrazing by native and non-native species; freedom from competition with invasive, non-native plants; and protection from excessive trampling or ground disturbance.

Of the 108 nonforested wetland plants, 81 are endangered and 27 are threatened. Critical habitat has been designated for 44 species.

The following representative threats have been synthesized from information available for several nonforested wetlands species.

- Habitat loss as a result of urbanization, agricultural conversion, and mining;
- Changes to hydrology resulting from flood control, groundwater withdrawal, and agricultural diversions;
- Diking of wetlands for water storage, agriculture, or salt production;
- Introduction of invasive plant species which compete for resources;
- Introduction of plant-eating animals such as goats, pigs, slugs, and rats;

- Grazing practices that are incompatible with the persistence of native flora;
- Off-highway vehicle use; and
- Sea-level rise and other climate change factors.

### 4.11.3 Freshwater Plants

Information on freshwater plants has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1990d) (U.S. Fish and Wildlife Service, 1996b) (U.S. Fish and Wildlife Service, Arizona Ecological Services Tucson Sub-Office, 2014).

Freshwater plants occur in streams, rivers, lakes, and estuaries and include both flowering and fern-like plants. Freshwater plants grow in gravel, sand, or rock areas at the borders of waterways, as well as in submerged or floating plant beds. Plants within this sub-group can also be described as submerged aquatic vegetation. The distribution of individual species is defined by climate, substrate types, depth, water quality, and other physical parameters.

The habitat needs of freshwater plants vary depending on the species, but may include access to standing or flowing water of suitable depth, turbidity levels, and water quality; protection from overgrazing by native and non-native species; freedom from competition with invasive, non-native plants; protection from excessive erosion and sedimentation; and a flood regime that maintains suitable habitat.

Of the six water plants, five are endangered and three are threatened. Critical habitat has been designated for one species.

The following representative threats to freshwater plants have been synthesized from information available for several species:

- Alteration of hydrologic regime, siltation, and erosion resulting from nearby activities such as construction;
- Sand and gravel mining along waterways;
- Improper livestock grazing around aquatic habitats;
- Groundwater extraction and diversion of surface waters;
- Alteration of water quality from non-point sources resulting in increased turbidity, eutrophication, or alteration of pH; and
- Changes in precipitation patterns and other climate change factors.

### 4.11.4 Nearshore Marine Plants

Information on nearshore marine plants has been synthesized from a variety of sources: (National Marine Fisheries Service, 2007c) (National Marine Fisheries Service, 2002).

The single species in this sub-group, Johnson's seagrass, occurs primarily in nearshore marine waters, and may occur in estuarine areas along the coast as well. This plant forms seagrass beds in some coastal bays of the Atlantic shoreline of Florida and may occur within the intertidal range. Johnson's seagrass may occur interspersed with other seagrass species and is an important component of nearshore marine benthic habitats where it occurs.

The habitat needs of nearshore marine plants include access to nearshore marine water of suitable depth, turbidity levels, and water quality; protection from overgrazing by native and non-native species; freedom from competition with invasive, non-native plants; and protection from excessive sediment disturbance and wave action.

Johnson's seagrass is listed as threatened and critical habitat has been designated for it.

The following threats to nearshore marine plants have been synthesized from information available for Johnson's seagrass:

- Alteration of hydrologic regime, siltation, and erosion resulting from nearby activities such as construction;
- The placement of fill for waterfront development;
- Dredging or sand and gravel mining along waterways;
- Increased turbidity, sediment disturbance, and wave action from boat traffic;
- Alteration of water quality from non-point sources resulting in increased turbidity, eutrophication, or alteration of pH; and
- Sea-level rise and other climate change factors.

### 4.11.5 Beach Plants

Information on beach plants has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1996c) (U.S. Fish and Wildlife Service, 1998g) (U.S. Fish and Wildlife Service, 2013b) (U.S. Fish and Wildlife Service, Pacific Island, 2014b).

Beach plants include flowering annual and perennial plants that are intolerant of saturated soils and generally adapted to salt spray, drought, windy conditions and sandy, poor, well-drained soils. Beach plants may grow on or near the shoreline or on sandy coastal dunes.

The habitat needs of beach plants vary depending on the species, but may include Access to appropriate sandy soils along coastlines; a disturbance regime that prevents the establishment of dense shrubs or trees but maintains beach dunes; protection from overgrazing by native and non-native species; freedom from competition with invasive, non-native plants; and protection from excessive trampling or ground disturbance.

Of the 15 beach plants, 10 are endangered and 5 are threatened. Critical habitat has been designated for one species.

The following representative threats to beach plants have been synthesized from information available for several species:

- Beach armoring or stabilization;
- Coastal development;
- Intensive recreational use, such as foot paths;
- Off-highway vehicle use;
- Sand mining;
- Introduction of invasive, non-native plants; and
- Sea-level rise and other climate change factors.

### 4.11.6 Inland Sandy Areas Plants

Information on plants of inland sandy areas has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1987c) (U.S. Fish and Wildlife Service, 1989b) (U.S. Fish and Wildlife Service, 1991d) (U.S. Fish and Wildlife Service, 1993g) (U.S. Fish and Wildlife Service, 2003b) (U.S. Fish and Wildlife Service, Pacific Island, 2014a).

These plants include cacti, succulents, flowering annual and perennial plants, and grasses which are found on accumulations of sand transported by wind, typically found in deserts but which may also occur in mesic areas. These habitats are characterized as having vegetation on one-third or less of the habitat area. Vegetation in these areas is often widely scattered and of a small stature. Cacti and other succulents are prominent members of this group.

The habitat needs of plants of inland sandy areas vary depending on the species, but may include: access to appropriate sandy soils; a disturbance regime that prevents the establishment of dense shrubs or trees but maintains areas of shifting or semi-stabilized sand; protection from overgrazing by native and non-native species; freedom from competition with invasive, non-native plants; and protection from excessive trampling or ground disturbance.

Of the 85 inland sandy area plants, 55 are endangered and 30 are threatened. Critical habitat has been designated for 33 species.

The following representative threats to plants of inland sandy areas have been synthesized from information available for several species:

- Off-highway vehicle use;
- Habitat loss as a result of urbanization, agricultural conversion, and mining;
- Collection of plants for horticultural use;
- Oil/gas development;
- Introduction of invasive, nonnative plants;
- Grazing practices that are incompatible with the persistence of native flora; and
- Introduction of plant-eating animals such as goats, pigs, slugs, and rats.

### 4.11.7 Rangeland Plants

Information on rangeland plants has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1999a) (U.S. Fish and Wildlife Service, 2000a) (U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, 2009b) (U.S. Fish and Wildlife Service, Sacramento Fish and Wildlife Office, 2010b) (U.S. Fish and Wildlife Service, Carlsbad Fish and Wildlife Office, 2013).

Rangeland plants include flowering shrubs, grasses, and a variety of flowering perennial and annual plants found in upland herbaceous, shrub and brush, and mixed rangeland habitats. These habitats occur in many climate zones, including arid, semi-arid, temperate, and subtropical, where conditions such as thin soils, poor soils, or harsh weather prevent the establishment of trees. In some rangeland ecosystems, fire (either natural or human-caused) plays an important role in maintaining vegetation structure and prevents the establishment of trees.

The habitat needs of rangeland plants vary depending on the species, but may include access to appropriate soils; a disturbance or climate regime that prevents the establishment of trees but maintains shrubby or herbaceous vegetation; protection from overgrazing by native and non-native species; freedom from competition with invasive, non-native plants; and protection from excessive trampling or ground disturbance.

Of the 253 rangeland plants, 191 are endangered, 61 are threatened, and 1 is proposed endangered. Critical habitat has been designated for 88 listed species.

The following representative threats to rangeland plants have been synthesized from information available for several species:

- Collection of plants for horticultural use;

- Habitat loss as a result of urbanization, agricultural conversion, and mining;
- Off-highway vehicle use;
- Oil and gas development;
- Alteration of fire regime;
- Introduction of invasive plant species which compete for resources;
- Introduction of plant-eating animals such as goats, pigs, slugs, and rats; and
- Grazing practices that are incompatible with the persistence of native flora.

### 4.11.8 Forest Land Plants

Information on forest land plants has been synthesized from a variety of sources: (U.S. Fish and Wildlife Service, 1987b) (U.S. Fish and Wildlife Service, 1992a) (U.S. Fish and Wildlife Service, 1993e) (U.S. Fish and Wildlife Service, 1998f) (U.S. Fish and Wildlife Service, 1999c) (U.S. Fish and Wildlife Service, 2011b) (U.S. Fish and Wildlife Service, 2014p) (U.S. Fish and Wildlife Service, 2015n) (U.S. Fish and Wildlife Service, 2015o) (U.S. Fish and Wildlife Service, 2015p) (U.S. Fish and Wildlife Service, 2015q).

Forest land plants include deciduous trees, conifers, ferns, and a variety of flowering plants that occur in upland deciduous, evergreen, and mixed forests. Forest lands are present across a wide range of climates and rainfall patterns, from tropical and temperate rainforests to dry subtropical forests and semi-arid montane conditions. Forest land plants are generally intolerant of saturated soils, thin soils, and extremely poor soils. Forest plants include large canopy trees, smaller understory trees, groundcover, and other short plants. In some forest systems, epiphytes (plants that derive moisture and nutrients from the air and rain and grow non-parasitically on another plant) are common.

The habitat needs of forest plants vary depending on the species, but may include access to appropriate soils; a disturbance or climate regime that allows the establishment and maturation of trees; protection from lumbering and overgrazing by native and non-native species; freedom from competition with invasive, non-native plants; and protection from excessive trampling or ground disturbance.

Of the 335 forest land plants, 313 are endangered, 19 are threatened, 2 are proposed endangered, and 1 is proposed threatened. Critical habitat has been designated for 208 listed species.

The following representative threats to forest land plants have been synthesized from information available for several species:

- Deforestation and habitat loss due to lumbering, mining, agricultural conversion, and urban development;
- Introduction of invasive plant species which compete for resources;
- Introduction of plant-eating animals such as goats, pigs, slugs, and rats;
- Collection of plants for horticulture;
- Alteration of fire regime; and
- Oil and gas development.

Table 4-9 lists all U.S. plants, by sub-group, which are listed or proposed threatened or endangered, the State(s) in which they are found, and whether critical habitat has been designated for the species.

**Table 4-9: Threatened and Endangered Plants in the U.S.**

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Forested Wetland Plants – Occur in the Action Area | | | | |
| Northern wild monkshood | *Aconitum noveboracense* | T | IA, NY, OH, WI | No |
| Georgia rockcress | *Arabis georgiana* | T | AL, GA | Yes |
| Jesup's milk-vetch | *Astragalus robbinsii var. jesupi* | E | NH, VT | No |
| Palo de ramon | *Banara vanderbiltii* | E | PR, FL | No |
| Ko`oko`olau | *Bidens campylotheca pentamera* | E | HI | No |
| Ko`oko`olau | *Bidens campylotheca waihoiensis* | E | HI | No |
| Ko`oko`olau | *Bidens conjuncta* | E | HI | No |
| Decurrent false aster | *Boltonia decurrens* | T | IL, MO | No |
| Texas poppy-mallow | *Callirhoe scabriuscula* | E | TX | No |
| Palma de manaca | *Calyptronoma rivalis* | T | PR | No |
| Brooksville bellflower | *Campanula robinsiae* | E | FL | No |
| Small-anthered bittercress | *Cardamine micranthera* | E | NC, VA | No |
| White sedge | *Carex albida* | E | CA | No |
| No common name | *Chamaecrista glandulosa var. mirabilis* | E | PR | No |
| `Akoko | *Chamaesyce remyi var. remyi* | E | HI | Yes |
| Papala | *Charpentiera densiflora* | E | HI | Yes |
| Cape Sable thoroughwort | *Chromolaena frustrata* | E | FL | Yes |
| Sacramento Mountains thistle | *Cirsium vinaceum* | T | NM | No |
| Cumberland rosemary | *Conradina verticillata* | T | KY, TN | No |
| Higuero de sierra | *Crescentia portoricensis* | E | PR | No |
| Haha | *Cyanea asplenifolia* | E | HI | No |
| Haha | *Cyanea copelandii ssp. haleakalaensis* | E | HI | Yes |
| Haha | *Cyanea dunbarii* | E | HI | Yes |
| Haha | *Cyanea glabra* | E | HI | Yes |
| Haha | *Cyanea grimesiana ssp. Obatae* | E | HI | Yes |
| Haha | *Cyanea kuhihewa* | E | HI | Yes |
| Haha | *Cyanea lanceolata* | E | HI | Yes |
| Haha | *Cyanea lobate* | E | HI | Yes |
| Haha | *Cyanea mauiensis* | E | | No |
| Haha | *Cyanea obtusa* | E | HI | No |
| Haha | *Cyanea procera* | E | HI | Yes |
| Popolo | *Cyanea solanacea* | E | HI | No |
| Haha | *Cyanea undulata* | E | HI | Yes |
| Ha`iwale | *Cyrtandra crenata* | E | HI | No |
| Mapele | *Cyrtandra cyaneoides* | E | HI | Yes |
| Ha`iwale | *Cyrtandra dentata* | E | HI | Yes |
| Ha`iwale | *Cyrtandra filipes* | E | HI | No |
| Ha`iwale | *Cyrtandra kaulantha* | E | HI | Yes |
| Ha`iwale | *Cyrtandra limahuliensis* | T | HI | Yes |
| Haiwale | *Cyrtandra nanawaleensis* | E | HI | No |
| Ha`iwale | *Cyrtandra oenobarba* | E | HI | Yes |
| Ha`iwale | *Cyrtandra oxybapha* | E | HI | No |
| Ha`iwale | *Cyrtandra viridiflora* | E | HI | Yes |
| Oha | *Delissea rivularis* | E | HI | Yes |
| Palapalai aumakua | *Dryopteris crinalis var. podosorus* | E | HI | Yes |
| Na`ena`e | *Dubautia pauciflorula* | E | HI | Yes |
| Na`ena`e | *Dubautia waialealae* | E | HI | Yes |
| No common name | *Elaphoglossum serpens* | E | PR | No |
| Minnesota dwarf trout lily | *Erythronium propullans* | E | MN | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Nohoanu | *Geranium hanaense* | E | HI | No |
| Nohoanu | *Geranium hillebrandii* | E | HI | No |
| Nohoanu | *Geranium kauaiense* | E | HI | Yes |
| Awiwi | *Hedyotis cookiana* | E | HI | Yes |
| Virginia sneezeweed | *Helenium virginicum* | T | MO, VA | No |
| Swamp pink | *Helonias bullata* | T | DE, GA, MD, NC, NJ, SC, VA, NY | No |
| Dwarf-flowered heartleaf | *Hexastylis naniflora* | T | NC, SC | No |
| Cooley's water-willow | *Justicia cooleyi* | E | FL | No |
| No common name | *Keysseria (=Lagenifera) erici* | E | HI | Yes |
| No common name | *Keysseria (=Lagenifera) helenae* | E | HI | Yes |
| Kamakahala | *Labordia cyrtandrae* | E | HI | Yes |
| Kamakahala | *Labordia pumila* | E | HI | Yes |
| Kamakahala | *Labordia tinifolia var. wahiawaensis* | E | HI | Yes |
| Pondberry | *Lindera melissifolia* | E | AL, AR, GA, MO, MS, NC, SC, LA, FL | No |
| lehua makanoe | *Lysimachia daphnoides* | E | HI | Yes |
| No common name | *Lysimachia scopulensis* | E | HI | Yes |
| Alani | *Melicope ovalis* | E | HI | Yes |
| Alani | *Melicope puberula* | E | HI | Yes |
| sea bean | *Mucuna sloanei persericea* | E | HI | No |
| Kolea | *Myrsine knudsenii* | E | HI | Yes |
| Kolea | *Myrsine vaccinioides* | E | HI | No |
| No common name | *Phyllostegia renovans* | E | HI | Yes |
| No common name | *Phyllostegia waimeae* | E | HI | Yes |
| Short's bladderpod | *Physaria globosa* | E | IN, KY, TN | Yes |
| Godfrey's butterwort | *Pinguicula ionantha* | T | FL | No |
| No common name | *Platanthera holochila* | E | HI | Yes |
| Lo'ulu | *Pritchardia lanigera* | E | HI | No |
| Knieskern's Beaked-rush | *Rhynchospora knieskernii* | T | DE, NJ | No |
| Bunched arrowhead | *Sagittaria fasciculata* | E | NC, SC | No |
| Green pitcher-plant | *Sarracenia oreophila* | E | AL, GA, NC, TN | No |
| No common name | *Schiedea laui* | E | HI | No |
| Northeastern bulrush | *Scirpus ancistrochaetus* | E | MA, MD, NH, NY, PA, VA, VT, WV | No |
| Tobusch fishhook cactus | *Sclerocactus brevihamatus ssp. tobuschii* | E | TX | No |
| Cobana negra | *Stahlia monosperma* | T | PR | No |
| Cooley's meadowrue | *Thalictrum cooleyi* | E | FL, GA, NC | No |
| No common name | *Thelypteris inabonensis* | E | PR | No |
| Nonforested Wetland Plants – Occur in the Action Area | | | | |
| Liliwai | *Acaena exigua* | E | HI | Yes |
| Sensitive joint-vetch | *Aeschynomene virginica* | T | MD, NC, NJ, VA, PA, DE | No |
| Sonoma alopecurus | *Alopecurus aequalis var. sonomensis* | E | CA | No |
| San Diego ambrosia | *Ambrosia pumila* | E | CA | Yes |
| Crenulate lead-plant | *Amorpha crenulata* | E | FL | No |
| Little amphianthus | *Amphianthus pusillus* | T | AL, GA, SC | No |
| Cumberland sandwort | *Arenaria cumberlandensis* | E | KY, TN | No |
| Marsh sandwort | *Arenaria paludicola* | E | CA, WA, OR | No |
| Sacramento prickly poppy | *Argemone pleiacantha ssp. pinnatisecta* | E | NM | No |
| Pa`iniu | *Astelia waialealae* | E | HI | Yes |
| Applegate's milk-vetch | *Astragalus applegatei* | E | CA, OR | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Fish Slough milk-vetch | *Astragalus lentiginosus var. piscinensis* | T | CA | Yes |
| Ventura Marsh Milk-vetch | *Astragalus pycnostachyus var. lanosissimus* | E | CA | Yes |
| Coastal dunes milk-vetch | *Astragalus tener var. titi* | E | CA | No |
| San Jacinto Valley crownscale | *Atriplex coronata var. notatior* | E | CA | Yes |
| Sonoma sunshine | *Blennosperma bakeri* | E | CA | No |
| Chinese Camp brodiaea | *Brodiaea pallida* | T | CA | No |
| Hillegrand's reedgrass | *Calamagrostis hillebrandii* | E | HI | No |
| `Awikiwiki | *Canavalia napaliensis* | E | HI | Yes |
| Fleshy owl's-clover | *Castilleja campestris ssp. succulenta* | T | CA | Yes |
| Spring-loving centaury | *Centaurium namophilum* | T | CA, NV | Yes |
| Hoover's spurge | *Chamaesyce hooveri* | T | CA | Yes |
| Fountain thistle | *Cirsium fontinale var. fontinale* | E | CA | No |
| Chorro Creek bog thistle | *Cirsium fontinale var. obispoense* | E | CA | No |
| Suisun thistle | *Cirsium hydrophilum var. hydrophilum* | E | CA | Yes |
| La Graciosa thistle | *Cirsium loncholepis* | E | CA | Yes |
| Salt marsh bird's-beak | *Cordylanthus maritimus ssp. maritimus* | E | CA | No |
| Soft bird's-beak | *Cordylanthus mollis ssp. Mollis* | E | CA | Yes |
| Palmate-bracted bird's beak | *Cordylanthus palmatus* | E | CA | No |
| Okeechobee gourd | *Cucurbita okeechobeensis ssp. Okeechobeensis* | E | FL | No |
| Pu`uka`a | *Cyperus trachysanthos* | E | HI | Yes |
| Santa Ana River woolly-star | *Eriastrum densifolium ssp. sanctorum* | E | CA | No |
| San Diego button-celery | *Eryngium aristulatum var. parishii* | E | CA | No |
| Loch Lomond coyote thistle | *Eryngium constancei* | E | CA | No |
| Penland alpine fen mustard | *Eutrema penlandii* | T | CO | No |
| Colorado Butterfly plant | *Gaura neomexicana var. coloradensis* | T | CO, NE, WY | Yes |
| Hawaiian red-flowered geranium | *Geranium arboreum* | E | HI | Yes |
| Ash Meadows gumplant | *Grindelia fraxinipratensis* | T | CA, NV | Yes |
| Harper's beauty | *Harperocallis flava* | E | FL | No |
| Pecos (=puzzle, =paradox) sunflower | *Helianthus paradoxus* | T | NM, TX | Yes |
| Whorled sunflower | *Helianthus verticillatus* | E | AL, GA, TN | Yes |
| Neches River rose-mallow | *Hibiscus dasycalyx* | T | TX | Yes |
| Black spored quillwort | *Isoetes melanospora* | E | GA, SC | No |
| Mat-forming quillwort | *Isoetes tegetiformans* | E | GA | No |
| Ash Meadows ivesia | *Ivesia kingii var. eremica* | T | CA, NV | Yes |
| Burke's goldfields | *Lasthenia burkei* | E | CA | No |
| Contra Costa goldfields | *Lasthenia conjugens* | E | CA | Yes |
| Spring Creek bladderpod | *Lesquerella perforata* | E | TN | No |
| Western lily | *Lilium occidentale* | E | CA, OR | No |
| Pitkin Marsh lily | *Lilium pardalinum ssp. Pitkinense* | E | CA | No |
| Butte County meadowfoam | *Limnanthes floccosa ssp. californica* | E | CA | Yes |
| Large-flowered woolly meadowfoam | *Limnanthes floccosa ssp. grandiflora* | E | OR | Yes |
| Sebastopol meadowfoam | *Limnanthes vinculans* | E | CA | No |
| Bradshaw's desert-parsley | *Lomatium bradshawii* | E | OR, WA | No |
| Cook's lomatium | *Lomatium cookii* | E | OR | Yes |
| Rough-leaved loosestrife | *Lysimachia asperulaefolia* | E | NC, SC | No |
| No common name | *Lysimachia filifolia* | E | HI | Yes |
| Mohr's Barbara button | *Marshallia mohrii* | T | AL, GA | No |
| Ihi`ihi | *Marsilea villosa* | E | HI | Yes |
| Michigan monkey-flower | *Mimulus michiganensis* | E | MI | No |
| Willowy monardella | *Monardella viminea* | E | CA | Yes |
| Spreading navarretia | *Navarretia fossalis* | T | CA | Yes |
| Few-flowered navarretia | *Navarretia leucocephala ssp. pauciflora (=N. pauciflora)* | E | CA | No |
| Many-flowered navarretia | *Navarretia leucocephala ssp. plieantha* | E | CA | No |
| Colusa grass | *Neostapfia colusana* | T | CA | Yes |
| Amargosa niterwort | *Nitrophila mohavensis* | E | CA, NV | Yes |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| California orcutt grass | *Orcuttia californica* | E | CA | No |
| San Joaquin orcutt grass | *Orcuttia inaequalis* | T | CA | Yes |
| Hairy orcutt grass | *Orcuttia pilosa* | E | CA | Yes |
| Slender orcutt grass | *Orcuttia tenuis* | T | CA, OR | Yes |
| Sacramento orcutt grass | *Orcuttia viscida* | E | CA | Yes |
| Canby's dropwort | *Oxypolis canbyi* | E | DE, GA, MD, NC, SC | No |
| Fassett's locoweed | *Oxytropis campestris var. chartacea* | T | WI | No |
| Lake County stonecrop | *Parvisedum leiocarpum* | E | CA | No |
| Furbish lousewort | *Pedicularis furbishiae* | E | ME | No |
| Ruth's golden aster | *Pityopsis ruthii* | E | TN | No |
| rough popcornflower | *Plagiobothrys hirtus* | E | OR | No |
| Calistoga allocarya | *Plagiobothrys strictus* | E | CA | No |
| Kuahiwi laukahi | *Plantago hawaiensis* | E | HI | Yes |
| Kuahiwi laukahi | *Plantago princeps* | E | HI | Yes |
| Eastern prairie fringed orchid | *Platanthera leucophaea* | T | IA, IL, IN, ME, MI, MO, OH, OK, VA, WI, PA, NY, NJ, NE, AR | No |
| Western prairie fringed orchid | *Platanthera praeclara* | T | IA, KS, MN, MO, ND, NE, OK, SD | No |
| Napa bluegrass | *Poa napensis* | E | CA | No |
| San Diego mesa-mint | *Pogogyne abramsii* | E | CA | No |
| Otay mesa-mint | *Pogogyne nudiuscula* | E | CA | No |
| Autumn Buttercup | *Ranunculus aestivalis (=acriformis)* | E | UT | No |
| Chapman rhododendron | *Rhododendron chapmanii* | E | FL | No |
| Gambel's watercress | *Rorippa gambellii* | E | CA | No |
| No common name | *Sanicula purpurea* | E | HI | Yes |
| Alabama canebrake pitcher-plant | *Sarracenia rubra ssp. alabamensis* | E | AL | No |
| Mountain sweet pitcher-plant | *Sarracenia rubra ssp. Jonesii* | E | NC, SC | No |
| Florida skullcap | *Scutellaria floridana* | T | FL | No |
| Kenwood Marsh checker-mallow | *Sidalcea oregana ssp. Valida* | E | CA | No |
| Wenatchee Mountains checker-mallow | *Sidalcea oregana var. calva* | E | WA | Yes |
| Pedate checker-mallow | *Sidalcea pedata* | E | CA | No |
| Virginia spiraea | *Spiraea virginiana* | T | GA, KY, NC, OH, TN, VA, WV, PA | No |
| Canelo Hills ladies'-tresses | *Spiranthes delitescens* | E | AZ | No |
| California taraxacum | *Taraxacum californicum* | E | CA | Yes |
| Howell's spectacular thelypody | *Thelypodium howellii spectabilis* | T | OR | No |
| Slender-petaled mustard | *Thelypodium stenopetalum* | E | CA | No |
| Hidden Lake bluecurls | *Trichostema austromontanum ssp. Compactum* | T | CA | No |
| Greene's tuctoria | *Tuctoria greenei* | E | CA, OR | Yes |
| Solano grass | *Tuctoria mucronata* | E | CA | Yes |
| Red Hills vervain | *Verbena californica* | T | CA | No |
| Nani wai`ale`ale | *Viola kauaiensis var. wahiawaensis* | E | HI | Yes |
| Tennessee yellow-eyed grass | *Xyris tennesseensis* | E | AL, GA, TN | No |
| Texas wild-rice | *Zizania texana* | E | TX | Yes |
| Ute ladies'-tresses | *Spiranthes diluvialis* | T | CO, ID, MT, NE, NV, UT, WA, WY | No |
| Freshwater Plants – Occur in the Action Area | | | | |
| Water howellia | *Howellia aquatilis* | T | CA, ID, MT, OR, WA | No |
| Louisiana quillwort | *Isoetes louisianensis* | E | AL, LA, MS | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Huachuca water-umbel | *Lilaeopsis schaffneriana var. recurva* | E | AZ | Yes |
| Little Aguja (=Creek) pondweed | *Potamogeton clystocarpus* | E | TX | No |
| Harperella | *Ptilimnium nodosum* | E | AL, AR, GA, MD, NC, OK, SC, VA, WV | No |
| Kral's water-plantain | *Sagittaria secundifolia* | T | AL, GA | No |
| Nearshore Marine Plants – Occur in the Action Area | | | | |
| Johnson's seagrass | *Halophila johnsonii* | T | FL | Yes |
| Beach Plants – Occur in the Action Area | | | | |
| Seabeach amaranth | *Amaranthus pumilus* | T | DE, NC, NJ, NY, SC, VA, RI, MD, MA | No |
| Howell's spineflower | *Chorizanthe howellii* | E | CA, FL | No |
| Monterey spineflower | *Chorizanthe pungens var. pungens* | T | CA | Yes |
| Robust spineflower | *Chorizanthe robusta var. robusta* | E | CA | No |
| Pitcher's thistle | *Cirsium pitcheri* | T | IL, IN, MI, WI | No |
| Menzies' wallflower | *Erysimum menziesii* | E | CA | No |
| Hoffmann's slender-flowered gilia | *Gilia tenuiflora ssp. Hoffmannii* | E | CA | No |
| Dwarf lake iris | *Iris lacustris* | T | MI, WI | No |
| Beach jacquemontia | *Jacquemontia reclinata* | E | FL | No |
| Beach layia | *Layia carnosa* | E | CA | No |
| Clover lupine | *Lupinus tidestromii* | E | CA | No |
| No common name | *Pittosporum halophilum* | E | HI | No |
| Dwarf naupaka | *Scaevola coriacea* | E | HI | No |
| Houghton's goldenrod | *Solidago houghtonii* | T | MI, NY | No |
| California seablite | *Suaeda californica* | E | CA | No |
| Inland Sandy Area Plants – Occur in the Action Area | | | | |
| Round-leaved chaff-flower | *Achyranthes splendens var. rotundata* | E | HI | Yes |
| Sandplain gerardia | *Agalinis acuta* | E | CT, MA, MD, NY, RI | No |
| Kearney's blue-star | *Amsonia kearneyana* | E | AZ | No |
| Shale barren rock cress | *Arabis serotina* | E | VA, WV | No |
| Dwarf Bear-poppy | *Arctomecon humilis* | E | UT | No |
| `Ahinahina | *Argyroxiphium sandwicense ssp. Macrocephalum* | T | HI | Yes |
| `Ahinahina | *Argyroxiphium sandwicense ssp. Sandwicense* | E | HI | No |
| Welsh's milkweed | *Asclepias welshii* | T | AZ, UT | Yes |
| Cushenbury milk-vetch | *Astragalus albens* | E | CA | Yes |
| Shivwits milk-vetch | *Astragalus ampullarioides* | E | UT | Yes |
| Sentry milk-vetch | *Astragalus cremnophylax var. cremnophylax* | E | AZ | No |
| Holmgren milk-vetch | *Astragalus holmgreniorum* | E | AZ, UT | Yes |
| Mancos milk-vetch | *Astragalus humillimus* | E | CO, NM | No |
| Coachella Valley milk-vetch | *Astragalus lentiginosus var. coachellae* | E | CA | Yes |
| Peirson's milk-vetch | *Astragalus magdalenae var. peirsonii* | T | CA | Yes |
| Heliotrope milk-vetch | *Astragalus montii* | T | UT | Yes |
| Star cactus | *Astrophytum asterias* | E | TX | No |
| Texas ayenia | *Ayenia limitaris* | E | TX | No |
| Kookoolau | *Bidens hillebrandiana ssp. hillebrandiana* | E | HI | No |
| Ko`oko`olau | *Bidens micrantha ctenophylla* | E | HI | No |
| Ko`oko`olau | *Bidens micrantha ssp. Kalealaha* | E | HI | Yes |
| Olulu | *Brighamia insignis* | E | HI | Yes |
| Pua `ala | *Brighamia rockii* | E | HI | Yes |
| Awiwi | *Centaurium sebaeoides* | E | HI | Yes |
| Deltoid spurge | *Chamaesyce deltoidea ssp. deltoidea* | E | FL | No |
| Garber's spurge | *Chamaesyce garberi* | T | FL | No |
| Nellie cory cactus | *Coryphantha minima* | E | TX | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Bunched cory cactus | *Coryphantha ramillosa* | T | TX | No |
| Cochise pincushion cactus | *Coryphantha robbinsiorum* | T | AZ | No |
| Pima pineapple cactus | *Coryphantha scheeri var. robustispina* | E | AZ | No |
| Avon Park harebells | *Crotalaria avonensis* | E | FL | No |
| Terlingua Creek cat's-eye | *Cryptantha crassipes* | E | TX | No |
| Jones cycladenia | *Cycladenia humilis var. jonesii* | T | AZ, UT | No |
| Haiwale | *Cyrtandra paliku* | E | HI | Yes |
| Leafy prairie-clover | *Dalea foliosa* | E | AL, IL, TN | No |
| Na`ena`e | *Dubautia plantaginea ssp. humilis* | E | HI | Yes |
| Marcescent dudleya | *Dudleya cymosa ssp. marcescens* | T | CA | No |
| Santa Clara Valley dudleya | *Dudleya setchellii* | E | CA | No |
| Laguna Beach liveforever | *Dudleya stolonifera* | T | CA | No |
| Santa Barbara Island liveforever | *Dudleya traskiae* | E | CA | No |
| Nichol's Turk's head cactus | *Echinocactus horizonthalonius var. nicholii* | E | AZ | No |
| Chisos Mountain hedgehog cactus | *Echinocereus chisoensis var. chisoensis* | T | TX | No |
| Kuenzler hedgehog cactus | *Echinocereus fendleri var. kuenzleri* | E | NM | No |
| Arizona hedgehog cactus | *Echinocereus triglochidiatus var. arizonicus* | E | AZ | No |
| Davis' green pitaya | *Echinocereus viridiflorus var. davisii* | E | TX | No |
| Acuna Cactus | *Echinomastus erectocentrus var. acunensis* | E | AZ | No |
| Lloyd's Mariposa cactus | *Echinomastus mariposensis* | T | TX | No |
| Zuni fleabane | *Erigeron rhizomatus* | T | AZ, NM | No |
| Umtanum Desert buckwheat | *Eriogonum codium* | T | WA | Yes |
| Gypsum wild-buckwheat | *Eriogonum gypsophilum* | T | NM | Yes |
| Steamboat buckwheat | *Eriogonum ovalifolium var. williamsiae* | E | NV | No |
| Clay-Loving wild buckwheat | *Eriogonum pelinophilum* | E | CO | Yes |
| Johnston's frankenia | *Frankenia johnstonii* | E | TX | No |
| Texas prairie dawn-flower | *Hymenoxys texana* | E | TX | No |
| `Anaunau | *Lepidium arbuscula* | E | HI | Yes |
| Barneby ridge-cress | *Lepidium barnebyanum* | E | UT | No |
| No common name | *Leptocereus grantianus* | E | PR | No |
| Dudley Bluffs bladderpod | *Lesquerella congesta* | T | CO | No |
| Zapata bladderpod | *Lesquerella thamnophila* | E | TX | Yes |
| Kodachrome bladderpod | *Lesquerella tumulosa* | E | UT | No |
| Heller's blazingstar | *Liatris helleri* | T | NC | No |
| No common name | *Lobelia niihauensis* | E | HI | Yes |
| Ash Meadows blazingstar | *Mentzelia leucophylla* | T | NV | Yes |
| Kulu`i | *Nototrichium humile* | E | HI | Yes |
| Eureka Valley evening-primrose | *Oenothera avita ssp. Eurekensis* | E | CA | No |
| San Francisco Peaks ragwort | *Packera franciscana* | T | AZ | Yes |
| Parachute beardtongue | *Penstemon debilis* | T | CO | Yes |
| Makou | *Peucedanum sandwicense* | T | HI | Yes |
| Clay phacelia | *Phacelia argillacea* | E | UT | No |
| North Park phacelia | *Phacelia formosula* | E | CO | No |
| DeBeque phacelia | *Phacelia submutica* | T | CO | Yes |
| White Bluffs bladderpod | *Physaria douglasii ssp. tuplashensis* | T | WA | Yes |
| Dudley Bluffs twinpod | *Physaria obcordata* | T | CO | No |
| Wahane | *Pritchardia aylmer-robinsonii* | E | HI | No |
| Leedy's roseroot | *Rhodiola integrifolia ssp. Leedyi* | T | MN, NY | No |
| No common name | *Schiedea haleakalensis* | E | HI | Yes |
| No common name | *Schiedea verticillata* | E | HI | Yes |
| Pariette cactus | *Sclerocactus brevispinus* | T | UT | No |
| Mesa Verde cactus | *Sclerocactus mesae-verdae* | T | CO, NM | No |
| Eureka Dune grass | *Swallenia alexandrae* | E | CA | No |
| No common name | *Tetramolopium filiforme* | E | HI | Yes |
| No common name | *Tetramolopium rockii* | T | HI | Yes |
| Alabama streak-sorus fern | *Thelypteris pilosa var. alabamensis* | T | AL | No |
| Santa Cruz Island fringepod | *Thysanocarpus conchuliferus* | E | CA | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Desert yellowhead | *Yermo xanthocephalus* | T | WY | Yes |
| Rangeland Plants – Occur in the Action Area | | | | |
| Ko`oloa`ula | *Abutilon menziesii* | E | HI | No |
| San Diego thornmint | *Acanthomintha ilicifolia* | T | CA | Yes |
| San Mateo thornmint | *Acanthomintha obovata ssp. duttonii* | E | CA | No |
| San Clemente Island lotus (=broom) | *Acmispon dendroideus var. traskiae (=Lotus d. ssp. traskiae)* | T | CA | No |
| No common name | *Agave eggersiana* | E | VI | Yes |
| Munz's onion | *Allium munzii* | E | CA | Yes |
| No common name | *Amaranthus brownii* | E | HI | Yes |
| South Texas ambrosia | *Ambrosia cheiranthifolia* | E | TX | No |
| Large-flowered fiddleneck | *Amsinckia grandiflora* | E | CA | Yes |
| Hoffmann's rock-cress | *Arabis hoffmannii* | E | CA | No |
| San Francisco manzanita | *Arctostaphylos franciscana* | E | CA | Yes |
| Del Mar manzanita | *Arctostaphylos glandulosa ssp. crassifolia* | E | CA | No |
| Presidio manzanita | *Arctostaphylos hookeri var. ravenii* | E | CA | No |
| Morro manzanita | *Arctostaphylos morroensis* | T | CA | No |
| Ione manzanita | *Arctostaphylos myrtifolia* | T | CA | No |
| Pallid manzanita | *Arctostaphylos pallida* | T | CA | No |
| Bear Valley sandwort | *Arenaria ursina* | T | CA | Yes |
| No common name | *Aristida chaseae* | E | PR | No |
| Pelos del diablo | *Aristida portoricensis* | E | PR | No |
| Mead's milkweed | *Asclepias meadii* | T | IA, IL, IN, KS, MO, WI | No |
| Four-petal pawpaw | *Asimina tetramera* | E | FL | No |
| Braunton's milk-vetch | *Astragalus brauntonii* | E | CA | Yes |
| Clara Hunt's milk-vetch | *Astragalus clarianus* | E | CA | No |
| Deseret milk-vetch | *Astragalus desereticus* | T | UT | No |
| Lane Mountain milk-vetch | *Astragalus jaegerianus* | E | CA | Yes |
| Osterhout milkvetch | *Astragalus osterhoutii* | E | CO | No |
| Ash meadows milk-vetch | *Astragalus phoenix* | T | CA, NV | Yes |
| Triple-ribbed milk-vetch | *Astragalus tricarinatus* | E | CA | No |
| Encinitas baccharis | *Baccharis vanessae* | T | CA | No |
| Nevin's barberry | *Berberis nevinii* | E | CA | Yes |
| Island barberry | *Berberis pinnata ssp. Insularis* | E | CA | No |
| Ko`oko`olau | *Bidens wiebkei* | E | HI | Yes |
| Florida bonamia | *Bonamia grandiflora* | T | FL | No |
| Thread-leaved brodiaea | *Brodiaea filifolia* | T | CA | Yes |
| Tiburon mariposa lily | *Calochortus tiburonensis* | T | CA | No |
| Mariposa pussypaws | *Calyptridium pulchellum* | T | CA | No |
| Stebbins' morning-glory | *Calystegia stebbinsii* | E | CA | No |
| San Benito evening-primrose | *Camissonia benitensis* | T | CA | No |
| `Awikiwiki | *Canavalia molokaiensis* | E | HI | Yes |
| `Awikiwiki | *Canavalia pubescens* | E | HI | No |
| Golden sedge | *Carex lutea* | E | NC | Yes |
| Navajo sedge | *Carex specuicola* | T | AZ, UT | Yes |
| Tiburon paintbrush | *Castilleja affinis ssp. Neglecta* | E | CA | No |
| Ash-grey paintbrush | *Castilleja cinerea* | T | CA | Yes |
| San Clemente Island indian paintbrush | *Castilleja grisea* | T | CA | No |
| Golden paintbrush | *Castilleja levisecta* | T | OR, WA | No |
| Soft-leaved paintbrush | *Castilleja mollis* | E | CA | No |
| California jewelflower | *Caulanthus californicus* | E | CA | No |
| Coyote ceanothus | *Ceanothus ferrisae* | E | CA | No |
| Vail Lake ceanothus | *Ceanothus ophiochilus* | T | CA | Yes |
| Pine Hill ceanothus | *Ceanothus roderickii* | E | CA | No |
| Catalina Island mountain-mahogany | *Cercocarpus traskiae* | E | CA | No |
| Fragrant prickly-apple | *Cereus eriophorus var. fragrans* | E | FL | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| `Akoko | *Chamaesyce celastroides var. kaenana* | E | HI | Yes |
| `Akoko | *Chamaesyce deppeana* | E | HI | Yes |
| `Akoko | *Chamaesyce kuwaleana* | E | HI | Yes |
| Ewa Plains `akoko | *Chamaesyce skottsbergii var. skottsbergii* | E | HI | Yes |
| Pygmy fringe-tree | *Chionanthus pygmaeus* | E | FL | No |
| Purple amole | *Chlorogalum purpureum* | T | CA, FL | Yes |
| Orcutt's spineflower | *Chorizanthe orcuttiana* | E | CA | No |
| Ben Lomond spineflower | *Chorizanthe pungens var. hartwegiana* | E | CA | No |
| Scotts Valley spineflower | *Chorizanthe robusta var. hartwegii* | E | CA | Yes |
| Sonoma spineflower | *Chorizanthe valida* | E | CA | No |
| Florida golden aster | *Chrysopsis floridana* | E | FL | No |
| Florida perforate cladonia | *Cladonia perforata* | E | FL | No |
| Presidio clarkia | *Clarkia franciscana* | E | CA | No |
| Vine Hill clarkia | *Clarkia imbricata* | E | CA | No |
| Pismo clarkia | *Clarkia speciosa ssp. Immaculata* | E | CA | No |
| Alabama leather flower | *Clematis socialis* | E | AL, GA | No |
| Pigeon wings | *Clitoria fragrans* | T | FL | No |
| Short-leaved rosemary | *Conradina brevifolia* | E | FL | No |
| Etonia rosemary | *Conradina etonia* | E | FL | No |
| Apalachicola rosemary | *Conradina glabra* | E | FL | No |
| Florida semaphore cactus | *Consolea corallicola* | E | FL | No |
| Pennell's bird's-beak | *Cordylanthus tenuis ssp. capillaris* | E | CA | No |
| Lee pincushion cactus | *Coryphantha sneedii var. leei* | T | NM | No |
| Sneed pincushion cactus | *Coryphantha sneedii var. sneedii* | E | NM, TX | No |
| Haha | *Cyanea humboldtiana* | E | HI | Yes |
| Haha | *Cyanea st.-johnii* | E | HI | Yes |
| Rugel's pawpaw | *Deeringothamnus rugelii* | E | FL | No |
| Otay tarplant | *Deinandra (=Hemizonia) conjugens* | T | CA | Yes |
| Gaviota tarplant | *Deinandra increscens ssp. villosa* | E | CA | Yes |
| Yellow larkspur | *Delphinium luteum* | E | CA | Yes |
| San Clemente Island larkspur | *Delphinium variegatum ssp. kinkiense* | E | CA | No |
| Garrett's mint | *Dicerandra christmanii* | E | FL | No |
| Longspurred mint | *Dicerandra cornutissima* | E | FL | No |
| Scrub mint | *Dicerandra frutescens* | E | FL | No |
| Lakela's mint | *Dicerandra immaculata* | E | FL | No |
| Slender-horned spineflower | *Dodecahema leptoceras* | E | CA | No |
| No common name | *Doryopteris takeuchii* | E | HI | Yes |
| Na`ena`e | *Dubautia herbstobatae* | E | HI | Yes |
| Conejo dudleya | *Dudleya abramsii ssp. Parva* | T | CA | No |
| Santa Monica Mountains dudleyea | *Dudleya cymosa ssp. Ovatifolia* | T | CA | No |
| Santa Cruz Island dudleya | *Dudleya nesiotica* | T | CA | No |
| Verity's dudleya | *Dudleya verityi* | T | CA | No |
| Smooth coneflower | *Echinacea laevigata* | E | GA, NC, SC, VA, PA, MD | No |
| Black lace cactus | *Echinocereus reichenbachii var. albertii* | E | TX | No |
| Ash Meadows sunray | *Enceliopsis nudicaulis var. corrugata* | T | CA, NV | Yes |
| Kern mallow | *Eremalche kernensis* | E | CA | No |
| Willamette daisy | *Erigeron decumbens var. decumbens* | E | OR | Yes |
| Parish's daisy | *Erigeron parishii* | T | CA | Yes |
| Indian Knob mountain balm | *Eriodictyon altissimum* | E | CA | No |
| Lompoc yerba santa | *Eriodictyon capitatum* | E | CA | Yes |
| Ione (incl. Irish Hill) buckwheat | *Eriogonum apricum (incl. var. prostratum)* | E | CA | No |
| Southern mountain wild-buckwheat | *Eriogonum kennedyi var. austromontanum* | T | CA | Yes |
| Scrub buckwheat | *Eriogonum longifolium var. gnaphalifolium* | T | FL | No |
| Cushenbury buckwheat | *Eriogonum ovalifolium var. vineum* | E | CA | Yes |
| Snakeroot | *Eryngium cuneifolium* | E | FL | No |
| Contra Costa wallflower | *Erysimum capitatum var. angustatum* | E | CA | Yes |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Ben Lomond wallflower | *Erysimum teretifolium* | E | CA | No |
| Telephus spurge | *Euphorbia telephioides* | T | FL | No |
| Pine Hill flannelbush | *Fremontodendron californicum ssp. Decumbens* | E | CA | No |
| Small's milkpea | *Galactia smallii* | E | FL | No |
| Island bedstraw | *Galium buxifolium* | E | CA | No |
| No common name | *Geocarpon minimum* | T | AR, LA, MO, TX | No |
| Monterey gilia | *Gilia tenuiflora ssp. Arenaria* | E | CA | No |
| No common name | *Gouania hillebrandii* | E | HI | Yes |
| No common name | *Gouania meyenii* | E | HI | Yes |
| No common name | *Gouania vitifolia* | E | HI | Yes |
| Showy stickseed | *Hackelia venusta* | E | WA | No |
| Honohono | *Haplostachys haplostachya* | E | HI | No |
| Aboriginal prickly-apple | *Harrisia (=Cereus) aboriginum (=gracilis)* | E | FL | No |
| Todsen's pennyroyal | *Hedeoma todsenii* | E | NM | Yes |
| Kopa | *Hedyotis schlechtendahliana var. remyi* | E | HI | No |
| Na Pali beach hedyotis | *Hedyotis st.-johnii* | E | HI | Yes |
| Island rush-rose | *Helianthemum greenei* | T | CA | No |
| Schweinitz's sunflower | *Helianthus schweinitzii* | E | NC, SC | No |
| Marin dwarf-flax | *Hesperolinon congestum* | T | CA | No |
| Slender rush-pea | *Hoffmannseggia tenella* | E | TX | No |
| Santa Cruz tarplant | *Holocarpha macradenia* | T | CA | Yes |
| Lakeside daisy | *Hymenoxys herbacea* | T | IL, MI, OH | No |
| Highlands scrub hypericum | *Hypericum cumulicola* | E | FL | No |
| Peter's Mountain mallow | *Iliamna corei* | E | VA | No |
| Hilo ischaemum | *Ischaemum byrone* | E | HI | Yes |
| Aupaka | *Isodendrion hosakae* | E | HI | Yes |
| Kohe malama o kanaloa | *Kanaloa kahoolawensis* | E | HI | Yes |
| [Unnamed] gladecress | *Leavenworthia crassa* | E | AL | Yes |
| Kentucky glade cress | *Leavenworthia exigua laciniata* | T | KY | Yes |
| Slickspot peppergrass | *Lepidium papilliferum* | PE | ID | No |
| Prairie bush-clover | *Lespedeza leptostachya* | T | IA, IL, MN, WI | No |
| Lyrate bladderpod | *Lesquerella lyrata* | T | AL | No |
| White bladderpod | *Lesquerella pallida* | E | TX | No |
| San Francisco lessingia | *Lessingia germanorum (=L.g. var. germanorum)* | E | CA | No |
| Scrub blazingstar | *Liatris ohlingerae* | E | FL | No |
| Carter's small-flowered flax | *Linum carteri* | E | FL | No |
| Nehe | *Lipochaeta kamolensis* | E | HI | Yes |
| Nehe | *Lipochaeta lobata var. leptophylla* | E | HI | Yes |
| No common name | *Lipochaeta venosa* | E | HI | No |
| Nehe | *Lipochaeta waimeaensis* | E | HI | Yes |
| No common name | *Lobelia gaudichaudii ssp. koolauensis* | E | HI | Yes |
| No common name | *Lobelia monostachya* | E | HI | Yes |
| No common name | *Lobelia oahuensis* | E | HI | Yes |
| Scrub lupine | *Lupinus aridorum* | E | FL | No |
| Nipomo Mesa lupine | *Lupinus nipomensis* | E | CA | No |
| Kincaid's Lupine | *Lupinus sulphureus ssp. Kincaidii* | T | OR, WA | Yes |
| No common name | *Lyonia truncata var. proctorii* | E | PR | No |
| No common name | *Lysimachia iniki* | E | HI | Yes |
| No common name | *Lysimachia lydgatei* | E | HI | Yes |
| No common name | *Lysimachia pendens* | E | HI | Yes |
| White birds-in-a-nest | *Macbridea alba* | T | FL | No |
| San Clemente Island bush-mallow | *Malacothamnus clementinus* | E | CA | No |
| Santa Cruz Island bush-mallow | *Malacothamnus fasciculatus var. nesioticus* | E | CA | No |
| Santa Cruz Island malacothrix | *Malacothrix indecora* | E | CA | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Island malacothrix | *Malacothrix squalida* | E | CA | No |
| Walker's manioc | *Manihot walkerae* | E | TX | No |
| Alani | *Melicope munroi* | E | HI | No |
| Vandenberg monkeyflower | *Mimulus fremontii var. vandenbergensis* | E | CA | No |
| MacFarlane's four-o'clock | *Mirabilis macfarlanei* | T | ID, OR | No |
| San Joaquin wooly-threads | *Monolopia (=Lembertia) congdonii* | E | CA | No |
| No common name | *Neraudia sericea* | E | HI | Yes |
| No common name | *Nesogenes rotensis* | E | NMI | No |
| Britton's beargrass | *Nolina brittoniana* | E | FL | No |
| Antioch Dunes evening-primrose | *Oenothera deltoides ssp. howellii* | E | CA | Yes |
| Bakersfield cactus | *Opuntia treleasei* | E | CA | No |
| Cushenbury oxytheca | *Oxytheca parishii var. goodmaniana* | E | CA | Yes |
| Carter's panicgrass | *Panicum fauriei var. carteri* | E | HI | Yes |
| Lau `ehu | *Panicum niihauense* | E | HI | Yes |
| Papery whitlow-wort | *Paronychia chartacea* | T | FL | No |
| Siler pincushion cactus | *Pediocactus (=Echinocactus,=Utahia) sileri* | T | AZ, UT | No |
| Brady pincushion cactus | *Pediocactus bradyi* | E | AZ | No |
| San Rafael cactus | *Pediocactus despainii* | E | UT | No |
| Knowlton's cactus | *Pediocactus knowltonii* | E | CO, NM | No |
| Fickeisen plains cactus | *Pediocactus peeblesianus fickeiseniae* | E | AZ | No |
| Peebles Navajo cactus | *Pediocactus peeblesianus var. peeblesianus* | E | AZ | No |
| Winkler cactus | *Pediocactus winkleri* | T | UT | No |
| Blowout penstemon | *Penstemon haydenii* | E | NE, WY | No |
| Penland beardtongue | *Penstemon penlandii* | E | CO | No |
| White-rayed pentachaeta | *Pentachaeta bellidiflora* | E | CA | No |
| Lyon's pentachaeta | *Pentachaeta lyonii* | E | CA | Yes |
| Island phacelia | *Phacelia insularis ssp. insularis* | E | CA | No |
| Texas trailing phlox | *Phlox nivalis ssp. texensis* | E | TX | No |
| Missouri bladderpod | *Physaria filiformis* | T | AR, MO | No |
| San Bernardino bluegrass | *Poa atropurpurea* | E | CA | Yes |
| Wireweed | *Polygonella basiramia* | E | FL | No |
| Sandlace | *Polygonella myriophylla* | E | FL | No |
| Scotts Valley polygonum | *Polygonum hickmanii* | E | CA | Yes |
| Aleutian shield fern | *Polystichum aleuticum* | E | AK | No |
| Po`e | *Portulaca sclerocarpa* | E | HI | Yes |
| Hickman's potentilla | *Potentilla hickmanii* | E | CA | No |
| Maguire primrose | *Primula maguirei* | T | UT | No |
| Scrub plum | *Prunus geniculata* | E | FL | No |
| Hartweg's golden sunburst | *Pseudobahia bahiifolia* | E | CA | No |
| San Joaquin adobe sunburst | *Pseudobahia peirsonii* | T | CA | No |
| Arizona Cliff-rose | *Purshia (=Cowania) subintegra* | E | AZ | No |
| Hinckley oak | *Quercus hinckleyi* | T | TX | No |
| No common name | *Remya montgomeryi* | E | HI | Yes |
| Michaux's sumac | *Rhus michauxii* | E | GA, NC, SC, VA | No |
| No common name | *Sanicula mariversa* | E | HI | Yes |
| Diamond Head schiedea | *Schiedea adamantis* | E | HI | No |
| Ma`oli`oli | *Schiedea apokremnos* | E | HI | Yes |
| No common name | *Schiedea lydgatei* | E | HI | Yes |
| No common name | *Schiedea salicaria* | E | HI | No |
| No common name | *Schiedea sarmentosa* | E | HI | Yes |
| Clay reed-mustard | *Schoenocrambe argillacea* | T | UT | No |
| Barneby reed-mustard | *Schoenocrambe barnebyi* | E | UT | No |
| Shrubby reed-mustard | *Schoenocrambe suffrutescens* | E | UT | No |
| American chaffseed | *Schwalbea americana* | E | AL, FL, GA, LA, MS, NC, NJ, SC, VA, TN, NY, MI, | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| | | | MD, MA, DE, CT | |
| Colorado hookless cactus | *Sclerocactus glaucus* | T | CO | No |
| Uinta Basin hookless cactus | *Sclerocactus wetlandicus* | T | UT | No |
| Wright fishhook cactus | *Sclerocactus wrightiae* | E | UT | No |
| Layne's butterweed | *Senecio layneae* | T | CA | No |
| Ohai | *Sesbania tomentosa* | E | HI | Yes |
| Santa Cruz Island rockcress | *Sibara filifolia* | E | CA | No |
| Keck's Checker-mallow | *Sidalcea keckii* | E | CA | Yes |
| Nelson's checker-mallow | *Sidalcea nelsoniana* | T | OR, WA | No |
| No common name | *Silene hawaiiensis* | T | HI | Yes |
| No common name | *Silene lanceolata* | E | HI | Yes |
| Spalding's catchfly | *Silene spaldingii* | T | ID, MT, OR, WA | No |
| Short's goldenrod | *Solidago shortii* | E | IN, KY | No |
| Blue Ridge goldenrod | *Solidago spithamaea* | T | NC, TN | No |
| Gierisch mallow | *Sphaeralcea gierischii* | E | AZ, UT | Yes |
| Navasota ladies'-tresses | *Spiranthes parksii* | E | TX | No |
| No common name | *Stenogyne angustifolia* | E | HI | No |
| Malheur wire-lettuce | *Stephanomeria malheurensis* | E | OR | Yes |
| Metcalf Canyon jewelflower | *Streptanthus albidus ssp. albidus* | E | CA | No |
| Tiburon jewelflower | *Streptanthus niger* | E | CA | No |
| Texas snowbells | *Styrax texanus* | E | TX | No |
| No common name | *Tetramolopium arenarium* | E | HI | No |
| Pamakani | *Tetramolopium capillare* | E | HI | Yes |
| No common name | *Tetramolopium lepidotum ssp. lepidotum* | E | HI | Yes |
| No common name | *Tetramolopium remyi* | E | HI | Yes |
| Kneeland Prairie penny-cress | *Thlaspi californicum* | E | CA | Yes |
| Ashy dogweed | *Thymophylla tephroleuca* | E | TX | No |
| Last Chance townsendia | *Townsendia aprica* | T | UT | No |
| No common name | *Trematolobelia singularis* | E | HI | Yes |
| Showy Indian clover | *Trifolium amoenum* | E | CA | No |
| Big-leaved crownbeard | *Verbesina dissita* | T | CA | No |
| No common name | *Vernonia proctorii* | E | PR | No |
| No common name | *Vigna o-wahuensis* | E | HI | Yes |
| Pamakani | *Viola chamissoniana ssp. chamissoniana* | E | HI | Yes |
| No common name | *Viola lanaiensis* | E | HI | No |
| No common name | *Viola oahuensis* | E | HI | Yes |
| Dwarf iliau | *Wilkesia hobdyi* | E | HI | Yes |
| Forest Land Plants – Occur in the Action Area | | | | |
| Large-fruited sand-verbena | *Abronia macrocarpa* | E | TX | No |
| No common name | *Abutilon eremitopetalum* | E | HI | Yes |
| No common name | *Abutilon sandwicense* | E | HI | Yes |
| No common name | *Achyranthes mutica* | E | HI | Yes |
| Pendant kihi fern | *Adenophorus periens* | E | HI | Yes |
| No common name | *Adiantum vivesii* | E | PR | No |
| Mahoe | *Alectryon macrococcus* | E | HI | Yes |
| Kuawawaenohu | *Alsinidendron lychnoides* | E | HI | Yes |
| No common name | *Alsinidendron viscosum* | E | HI | Yes |
| Price's potato-bean | *Apios priceana* | T | AL, IL, KY, MS, TN | No |
| McDonald's rock-cress | *Arabis macdonaldiana* | E | CA, OR | No |
| Braun's rock-cress | *Arabis perstellata* | E | KY, TN | Yes |
| Santa Rosa Island manzanita | *Arctostaphylos confertiflora* | E | CA | No |
| Mauna Loa (=Ka'u) silversword | *Argyroxiphium kauense* | E | HI | Yes |
| No common name | *Asplenium fragile insulare* | E | HI | Yes |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| American hart's-tongue fern | *Asplenium scolopendrium var. americanum* | T | AL, MI, NY, TN | No |
| Guthrie's (=Pyne's) ground-plum | *Astragalus bibullatus* | E | TN | No |
| No common name | *Auerodendron pauciflorum* | E | PR | No |
| Hairy rattleweed | *Baptisia arachnifera* | E | GA | No |
| Virginia round-leaf birch | *Betula uber* | T | VA | No |
| Ko`oko`olau | *Bidens amplectens* | E | HI | Yes |
| No common name | *Bonamia menziesii* | E | HI | Yes |
| Florida brickell-bush | *Brickellia mosieri* | E | FL | No |
| Vahl's boxwood | *Buxus vahlii* | E | PR, VI | No |
| Uhiuhi | *Caesalpinia kavaiense* | E | HI | No |
| Capa rosa | *Callicarpa ampla* | E | PR | No |
| No common name | *Calyptranthes thomasiana* | E | VI | No |
| No common name | *Catesbaea melanocarpa* | E | PR, VI | Yes |
| Kamanomano | *Cenchrus agrimonioides* | E | HI | Yes |
| `Akoko | *Chamaesyce eleanoriae* | E | HI | Yes |
| No common name | *Chamaesyce halemanui* | E | HI | Yes |
| `Akoko | *Chamaesyce herbstii* | E | HI | Yes |
| `Akoko | *Chamaesyce remyi var. kauaiensis* | E | HI | Yes |
| `Akoko | *Chamaesyce rockii* | E | HI | Yes |
| Springville clarkia | *Clarkia springvillensis* | T | CA | No |
| Morefield's leather flower | *Clematis morefieldii* | E | AL, TN | No |
| `Oha wai | *Clermontia drepanomorpha* | E | HI | Yes |
| `Oha wai | *Clermontia lindseyana* | E | HI | Yes |
| `Oha wai | *Clermontia oblongifolia ssp. brevipes* | E | HI | Yes |
| `Oha wai | *Clermontia oblongifolia ssp. mauiensis* | E | HI | Yes |
| `Oha wai | *Clermontia peleana* | E | HI | Yes |
| `Oha wai | *Clermontia pyrularia* | E | HI | Yes |
| `Oha wai | *Clermontia samuelii* | E | HI | Yes |
| Kauila | *Colubrina oppositifolia* | E | HI | Yes |
| No common name | *Cordia bellonis* | E | PR | No |
| Palo de nigua | *Cornutia obovata* | E | PR | No |
| No common name | *Cranichis ricartii* | E | PR | No |
| Pauoa | *Ctenitis squamigera* | E | HI | Yes |
| Santa Cruz cypress | *Cupressus abramsiana* | E | CA | No |
| Gowen cypress | *Cupressus goveniana ssp. goveniana* | T | CA | No |
| No common name | *Cyanea (=Rollandia) crispa* | E | HI | Yes |
| Haha | *Cyanea acuminata* | E | HI | Yes |
| Haha | *Cyanea asarifolia* | E | HI | Yes |
| Haha | *Cyanea calycina* | E | HI | Yes |
| Haha | *Cyanea copelandii ssp. copelandii* | E | HI | No |
| Haha | *Cyanea dolichopoda* | E | HI | Yes |
| Haha | *Cyanea duvalliorum* | E | HI | No |
| Haha | *Cyanea eleeleensis* | E | HI | Yes |
| Haiwale | *Cyrtandra ferripilosa* | E | HI | No |
| Haha | *Cyanea grimesiana ssp. grimesiana* | E | HI | Yes |
| Haha | *Cyanea hamatiflora ssp. carlsonii* | E | HI | Yes |
| Haha | *Cyanea hamatiflora ssp. hamatiflora* | E | HI | Yes |
| haha nui | *Cyanea horrida* | E | HI | No |
| Haha | *Cyanea kolekoleensis* | E | HI | Yes |
| Haha | *Cyanea koolauensis* | E | HI | Yes |
| Haha | *Cyanea kunthiana* | E | HI | No |
| Haha | *Cyanea longiflora* | E | HI | Yes |
| Haha | *Cyanea macrostegia ssp. gibsonii* | E | HI | No |
| Haha | *Cyanea magnicalyx* | E | HI | No |
| Haha | *Cyanea mannii* | E | HI | Yes |
| Haha | *Cyanea maritae* | E | HI | No |

| Common Name | Scientific Name | Status | State(s) Found | Critical Habitat Designated? |
|---|---|---|---|---|
| Haha | *Cyanea marksii* | E | HI | No |
| Haha | *Cyanea munroi* | E | HI | No |
| Haha | *Cyanea pinnatifida* | E | HI | Yes |
| Haha | *Cyanea platyphylla* | E | HI | Yes |
| No common name | *Cyanea profuga* | E | HI; Believed to be extinct | No |
| No common name | *Cyanea purpurellifolia* | E | HI; Believed to be extinct | Yes |
| Haha | *Cyanea recta* | T | HI | Yes |
| Haha | *Cyanea remyi* | E | HI | Yes |
| Haha | *Cyanea shipmanii* | E | HI | Yes |
| Haha | *Cyanea stictophylla* | E | HI | Yes |
| Haha | *Cyanea superba* | E | HI | Yes |
| `aku | *Cyanea tritomantha* | E | HI | No |
| Haha | *Cyanea truncata* | E | HI | Yes |
| Elfin tree fern | *Cyathea dryopteroides* | E | PR | No |
| No common name | *Cyperus pennatiformis* | E | HI | Yes |
| Ha`iwale | *Cyrtandra giffardii* | E | HI | Yes |
| No common name | *Cyrtandra gracilis* | E | HI; Believed to be extinct | Yes |
| Ha`iwale | *Cyrtandra munroi* | E | HI | Yes |
| Ha`iwale | *Cyrtandra polyantha* | E | HI | Yes |
| Ha`iwale | *Cyrtandra sessilis* | E | HI | Yes |
| Ha`iwale | *Cyrtandra subumbellata* | E | HI | Yes |
| Ha`iwale | *Cyrtandra tintinnabula* | E | HI | Yes |
| Haiwale | *Cyrtandra wagneri* | E | HI | No |
| No common name | *Cyrtandra waiolani* | E | HI; Believed to be extinct | Yes |
| No common name | *Daphnopsis hellerana* | E | PR | No |
| Beautiful pawpaw | *Deeringothamnus pulchellus* | E | FL | No |
| No common name | *Delissea rhytidosperma* | E | HI | Yes |
| Oha | *Delissea subcordata* | E | HI | Yes |
| No common name | *Delissea undulata* | E | HI | Yes |
| Baker's larkspur | *Delphinium bakeri* | E | CA | Yes |
| Asplenium-leaved diellia | *Diellia erecta* | E | HI | Yes |
| No common name | *Diellia falcata* | E | HI | Yes |
| No common name | *Diellia mannii* | E | HI | Yes |
| No common name | *Diellia pallida* | E | HI | Yes |
| No common name | *Diellia unisora* | E | HI | Yes |
| No common name | *Diplazium molokaiense* | E | HI | Yes |
| No common name | *Doryopteris angelica* | E | HI | Yes |
| Na`ena`e | *Dubautia imbricata* | E | HI | Yes |
| Naenae | *Dubautia kalalauensis* | E | HI | Yes |
| Naenae | *Dubautia kenwoodii* | E | HI | Yes |
| Na`ena`e | *Dubautia latifolia* | E | HI | Yes |
| Na`ena`e | *Dubautia plantaginea magnifolia* | E | HI | Yes |
| Fosberg's love grass | *Eragrostis fosbergii* | E | HI | Yes |
| San Mateo woolly sunflower | *Eriophyllum latilobum* | E | CA | No |
| Uvillo | *Eugenia haematocarpa* | E | PR | No |
| Nioi | *Eugenia koolauensis* | E | HI | Yes |
| No common name | *Eugenia woodburyana* | E | PR | No |
| `Akoko | *Euphorbia haeleeleana* | E | HI | Yes |
| Heau | *Exocarpos luteolus* | E | HI | Yes |
| No common name | *Festuca molokaiensis* | E | HI | No |
| Mehamehame | *Flueggea neowawraea* | E | HI | Yes |
| Mexican flannelbush | *Fremontodendron mexicanum* | E | CA | Yes |
| Gentner's fritillary | *Fritillaria gentneri* | E | CA, OR | No |
| El Dorado bedstraw | *Galium californicum ssp. sierrae* | E | CA | No |

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|---|---|---|---|---|
| Hawaiian gardenia (=Na`u) | *Gardenia brighamii* | E | HI | No |
| Nanu | *Gardenia mannii* | E | HI | Yes |
| Nohoanu | *Geranium multiflorum* | E | HI | Yes |
| No common name | *Gesneria pauciflora* | T | PR | No |
| Spreading avens | *Geum radiatum* | E | NC, TN | No |
| Beautiful goetzea | *Goetzea elegans* | E | PR | No |
| No common name | *Gonocalyx concolor* | E | PR | Yes |
| Rock gnome lichen | *Gymnoderma lineare* | E | NC, SC, TN, VA | No |
| Higo chumbo | *Harrisia portoricensis* | T | PR | No |
| Pilo | *Hedyotis mannii* | E | HI | Yes |
| Roan Mountain bluet | *Hedyotis purpurea var. montana* | E | NC, TN, VA | No |
| Ufa-halomtano | *Heritiera longipetiolata* | PE | GU, NMI | No |
| No common name | *Hesperomannia arborescens* | E | HI | Yes |
| No common name | *Hesperomannia arbuscula* | E | HI | Yes |
| No common name | *Hesperomannia lydgatei* | E | HI | Yes |
| Kauai hau kuahiwi | *Hibiscadelphus distans* | E | HI | No |
| Hau kuahiwi | *Hibiscadelphus giffardianus* | E | HI | Yes |
| Hau kuahiwi | *Hibiscadelphus hualalaiensis* | E | HI | Yes |
| Hau kuahiwi | *Hibiscadelphus woodii* | E | HI | Yes |
| Koki`o ke`oke`o | *Hibiscus arnottianus ssp. immaculatus* | E | HI | Yes |
| (=Native yellow hibiscus) ma`o hau hele | *Hibiscus brackenridgei* | E | HI | Yes |
| Clay's hibiscus | *Hibiscus clayi* | E | HI | Yes |
| Koki`o ke`oke`o | *Hibiscus waimeae ssp. hannerae* | E | HI | Yes |
| Mountain golden heather | *Hudsonia montana* | T | NC | Yes |
| Wawae`iole | *Huperzia mannii* | E | HI | Yes |
| Wawae`iole | *Huperzia nutans* | E | HI | Yes |
| Cook's holly | *Ilex cookii* | E | PR | No |
| No common name | *Ilex sintenisii* | E | PR | No |
| Pagosa skyrocket | *Ipomopsis polyantha* | E | CO | Yes |
| Holy Ghost ipomopsis | *Ipomopsis sancti-spiritus* | E | NM | No |
| Aupaka | *Isodendrion laurifolium* | E | HI | Yes |
| Aupaka | *Isodendrion longifolium* | T | HI | Yes |
| Kula wahine noho | *Isodendrion pyrifolium* | E | HI | Yes |
| Small-whorled pogonia | *Isotria medeoloides* | T | CT, DE, GA, IL, MA, ME, MI, MO, NC, NH, NJ, NY, OH, PA, RI, SC, TN, VA, WV, VT, MD, DC | No |
| Webber ivesia | *Ivesia webberi* | T | CA, NV | Yes |
| West Indian walnut (=Nogal) | *Juglans jamaicensis* | E | PR | No |
| Kio`ele | *Kadua coriacea* | E | HI | Yes |
| No common name | *Kadua degeneri* | E | HI | Yes |
| No common name | *Kadua parvula* | E | HI | Yes |
| Cooke's koki`o | *Kokia cookei* | E | HI | No |
| Koki`o | *Kokia kauaiensis* | E | HI | Yes |
| Hulumoa | *Korthalsella degeneri* | E | HI | Yes |
| Kamakahala | *Labordia helleri* | E | HI | Yes |
| Kamakahala | *Labordia lydgatei* | E | HI | Yes |
| Kamakahala | *Labordia tinifolia var. lanaiensis* | E | HI | No |
| Kamakahala | *Labordia triflora* | E | HI | Yes |
| Texas golden gladecress | *Leavenworthia texana* | E | TX | Yes |
| No common name | *Lepanthes eltoroensis* | E | PR | No |
| San Bernardino Mountains bladderpod | *Lesquerella kingii ssp. bernardina* | E | CA | Yes |
| Nehe | *Lipochaeta fauriei* | E | HI | Yes |

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|---|---|---|---|---|
| Nehe | *Lipochaeta micrantha* | E | HI | Yes |
| San Clemente Island woodland-star | *Lithophragma maximum* | E | CA | No |
| No common name | *Lysimachia maxima* | E | HI | Yes |
| No common name | *Lysimachia venosa* | E | HI | Yes |
| No common name | *Mariscus fauriei* | E | HI | Yes |
| Nehe | *Melanthera tenuifolia* | E | HI | Yes |
| Alani | *Melicope adscendens* | E | HI | Yes |
| Alani | *Melicope balloui* | E | HI | Yes |
| Alani | *Melicope christophersenii* | E | HI | Yes |
| Alani | *Melicope degeneri* | E | HI | Yes |
| Alani | *Melicope haupuensis* | E | HI | Yes |
| Alani | *Melicope hiiakae* | E | HI | Yes |
| Alani | *Melicope knudsenii* | E | HI | Yes |
| Alani | *Melicope lydgatei* | E | HI | Yes |
| Alani | *Melicope makahae* | E | HI | Yes |
| Alani | *Melicope mucronulata* | E | HI | Yes |
| Alani | *Melicope pallida* | E | HI | Yes |
| Alani | *Melicope paniculata* | E | HI | Yes |
| Alani | *Melicope quadrangularis* | E | HI | No |
| Alani | *Melicope reflexa* | E | HI | Yes |
| Alani | *Melicope saint-johnii* | E | HI | Yes |
| Alani | *Melicope zahlbruckneri* | E | HI | Yes |
| No common name | *Mitracarpus maxwelliae* | E | PR | No |
| No common name | *Mitracarpus polycladus* | E | PR | No |
| No common name | *Munroidendron racemosum* | E | HI | Yes |
| No common name | *Myrcia paganii* | E | PR | No |
| Kolea | *Myrsine juddii* | E | HI | Yes |
| Kolea | *Myrsine linearifolia* | T | HI | Yes |
| Kolea | *Myrsine mezii* | E | HI; Believed to be extinct | Yes |
| No common name | *Neraudia angulata* | E | HI | Yes |
| No common name | *Neraudia ovata* | E | HI | Yes |
| `Aiea | *Nothocestrum breviflorum* | E | HI | Yes |
| `Aiea | *Nothocestrum peltatum* | E | HI | Yes |
| Holei | *Ochrosia kilaueaensis* | E | HI | No |
| No common name | *Osmoxylon mariannense* | E | NMI | No |
| Palo de rosa | *Ottoschulzia rhodoxylon* | E | PR | No |
| `Ala `ala wai nui | *Peperomia subpetiolata* | E | HI | No |
| Wheeler's peperomia | *Peperomia wheeleri* | E | PR | No |
| Yreka phlox | *Phlox hirsuta* | E | CA | No |
| No common name | *Phyllostegia bracteata* | E | HI | No |
| No common name | *Phyllostegia floribunda* | E | HI | No |
| No common name | *Phyllostegia glabra var. lanaiensis* | E | HI | No |
| No common name | *Phyllostegia haliakalae* | E | HI | No |
| No common name | *Phyllostegia hirsuta* | E | HI | Yes |
| No common name | *Phyllostegia hispida* | E | HI | No |
| No common name | *Phyllostegia kaalaensis* | E | HI | Yes |
| No common name | *Phyllostegia knudsenii* | E | HI | Yes |
| No common name | *Phyllostegia mannii* | E | HI | Yes |
| No common name | *Phyllostegia mollis* | E | HI | Yes |
| No common name | *Phyllostegia parviflora* | E | HI | Yes |
| No common name | *Phyllostegia pilosa* | E | HI | No |
| Kiponapona | *Phyllostegia racemosa* | E | HI | Yes |
| No common name | *Phyllostegia velutina* | E | HI | Yes |
| No common name | *Phyllostegia warshaueri* | E | HI | Yes |
| No common name | *Phyllostegia wawrana* | E | HI | Yes |
| Key tree cactus | *Pilosocereus robinii* | E | FL | No |

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|---|---|---|---|---|
| Yadon's piperia | *Piperia yadonii* | E | CA | Yes |
| No common name | *Pittosporum hawaiiense* | E | HI | No |
| Ho`awa | *Pittosporum napaliense* | E | HI | Yes |
| No common name | *Platydesma cornuta* | E | HI | Yes |
| No common name | *Platydesma cornuta decurrens* | E | HI | Yes |
| No common name | *Platydesma remyi* | E | HI | No |
| Pilo kea lau li`i | *Platydesma rostrata* | E | HI | Yes |
| Chupacallos | *Pleodendron macranthum* | E | PR | No |
| Hala pepe | *Pleomele fernaldii* | E | HI | No |
| Hala pepe | *Pleomele forbesii* | E | HI | Yes |
| Hala pepe | *Pleomele hawaiiensis* | E | HI | Yes |
| Mann's bluegrass | *Poa mannii* | E | HI | Yes |
| Hawaiian bluegrass | *Poa sandvicensis* | E | HI | Yes |
| No common name | *Poa siphonoglossa* | E | HI | Yes |
| Lewton's polygala | *Polygala lewtonii* | E | FL | No |
| Tiny polygala | *Polygala smallii* | E | FL | No |
| No common name | *Polystichum calderonense* | E | PR | No |
| Lo`ulu | *Pritchardia affinis* | E | HI | No |
| (=Na`ena`e) lo`ulu | *Pritchardia hardyi* | E | HI | No |
| Lo`ulu | *Pritchardia kaalae* | E | HI | No |
| Lo`ulu | *Pritchardia munroi* | E | HI | Yes |
| Lo`ulu | *Pritchardia napaliensis* | E | HI | No |
| Lo`ulu | *Pritchardia remota* | E | HI | Yes |
| Lo`ulu | *Pritchardia schattaueri* | E | HI | No |
| Lo`ulu | *Pritchardia viscosa* | E | HI | No |
| Kopiko | *Psychotria grandiflora* | E | HI | Yes |
| Oahu wild coffee (=kopiko) | *Psychotria hexandra ssp. oahuensis* | E | HI | Yes |
| Kopiko | *Psychotria hobdyi* | E | HI | Yes |
| Kaulu | *Pteralyxia kauaiensis* | E | HI | Yes |
| Kaulu | *Pteralyxia macrocarpa* | E | HI | Yes |
| No common name | *Pteris lidgatei* | E | HI, PR | Yes |
| No common name | *Remya kauaiensis* | E | HI | Yes |
| Maui remya | *Remya mauiensis* | E | HI | Yes |
| Miccosukee gooseberry | *Ribes echinellum* | T | FL, SC | No |
| Lanai sandalwood (=`iliahi) | *Santalum freycinetianum var. lanaiense* | E | HI | No |
| No common name | *Schiedea attenuata* | E | HI | Yes |
| No common name | *Schiedea diffusa ssp. macraei* | E | HI | No |
| Ma`oli`oli | *Schiedea hawaiiensis* | E | HI | No |
| No common name | *Schiedea helleri* | E | HI | Yes |
| No common name | *Schiedea hookeri* | E | HI | Yes |
| No common name | *Schiedea jacobii* | E | HI | No |
| No common name | *Schiedea kaalae* | E | HI | Yes |
| No common name | *Schiedea kauaiensis* | E | HI | Yes |
| Ma`oli`oli | *Schiedea kealiae* | E | HI | Yes |
| No common name | *Schiedea membranacea* | E | HI | Yes |
| No common name | *Schiedea nuttallii* | E | HI | Yes |
| No common name | *Schiedea obovata* | E | HI | Yes |
| No common name | *Schiedea spergulina var. leiopoda* | E | HI | Yes |
| No common name | *Schiedea spergulina var. spergulina* | T | HI | Yes |
| Laulihilihi | *Schiedea stellarioides* | E | HI | Yes |
| No common name | *Schiedea trinervis* | E | HI | Yes |
| No common name | *Schoepfia arenaria* | T | PR | No |
| Large-flowered skullcap | *Scutellaria montana* | T | GA, TN | No |
| Hayun Iagu (=(Guam), Tronkon guafi (Rota)) | *Serianthes nelsonii* | E | GU, NMI | No |
| `Anunu | *Sicyos alba* | E | HI | Yes |
| No common name | *Silene alexandri* | E | HI | Yes |

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|---|---|---|---|---|
| No common name | *Silene perlmanii* | E | HI | Yes |
| Fringed campion | *Silene polypetala* | E | FL, GA | No |
| White irisette | *Sisyrinchium dichotomum* | E | NC, SC | No |
| Erubia | *Solanum drymophilum* | E | PR | No |
| Popolo ku mai | *Solanum incompletum* | E | HI | Yes |
| `Aiakeakua, popolo | *Solanum sandwicense* | E | HI | Yes |
| White-haired goldenrod | *Solidago albopilosa* | T | KY | No |
| No common name | *Spermolepis hawaiiensis* | E | HI | Yes |
| Gentian pinkroot | *Spigelia gentianoides* | E | AL, FL | No |
| No common name | *Stenogyne bifida* | E | HI | Yes |
| No common name | *Stenogyne campanulata* | E | HI | Yes |
| No common name | *Stenogyne cranwelliae* | E | HI | No |
| No common name | *Stenogyne kanehoana* | E | HI | Yes |
| No common name | *Stenogyne kauaulaensis* | E | HI | No |
| No common name | *Stenogyne kealiae* | E | HI | Yes |
| Palo de jazmin | *Styrax portoricensis* | E | PR | No |
| No common name | *Tabernaemontana rotensis* | PT | GU, NMI | No |
| No common name | *Tectaria estremerana* | E | PR | No |
| Palo Colorado | *Ternstroemia luquillensis* | E | PR | No |
| No common name | *Ternstroemia subsessilis* | E | PR | No |
| No common name | *Tetraplasandra bisattenuata* | E | HI | Yes |
| No common name | *Tetraplasandra flynnii* | E | HI | Yes |
| `Ohe`ohe | *Tetraplasandra gymnocarpa* | E | HI | Yes |
| No common name | *Tetraplasandra lydgatei* | E | HI | Yes |
| No common name | *Thelypteris verecunda* | E | PR | No |
| No common name | *Thelypteris yaucoensis* | E | PR | No |
| Florida torreya | *Torreya taxifolia* | E | FL, GA | No |
| Bariaco | *Trichilia triacantha* | E | PR | No |
| Florida bristle fern | *Trichomanes punctatum ssp. floridanum* | PE | FL | No |
| Running buffalo clover | *Trifolium stoloniferum* | E | AR, IN, KY, MO, OH, WV, KS, IL | No |
| Monterey clover | *Trifolium trichocalyx* | E | CA | No |
| Persistent trillium | *Trillium persistens* | E | GA, SC | No |
| Relict trillium | *Trillium reliquum* | E | AL, GA, SC | No |
| Opuhe | *Urera kaalae* | E | HI | Yes |
| No common name | *Varronia rupicola* | T | PR | Yes |
| Hawaiian vetch | *Vicia menziesii* | E | HI | No |
| No common name | *Viola helenae* | E | HI | Yes |
| Wide-leaf warea | *Warea amplexifolia* | E | FL | No |
| Carter's mustard | *Warea carteri* | E | FL | No |
| No common name | *Wikstroemia villosa* | E | HI | No |
| No common name | *Xylosma crenatum* | E | HI | Yes |
| A`e | *Zanthoxylum dipetalum var. tomentosum* | E | HI | Yes |
| A`e | *Zanthoxylum hawaiiense* | E | HI | Yes |
| A`e | *Zanthoxylum oahuense* | E | HI | Yes |
| St. Thomas prickly-ash | *Zanthoxylum thomasianum* | E | PR, VI | No |
| Florida ziziphus | *Ziziphus celata* | E | FL | No |
| Haha | *Cyanea mceldowneyi* | E | HI | Yes |
| Koki`o | *Kokia drynarioides* | E | HI | Yes |
| Source: (U.S. Fish and Wildlife Service, 2014m)<br>E = Endangered; T = Threatened; PE = Proposed Endangered; PT = Proposed Threatened | | | | |

## 4.12 Species Sub-Group Habitats within Action Area

Table 4-10 lists species groups and habitat classifications (sub-groups) and whether those habitats occur within the Action Area (see discussion in Section 4.3 for the process used to determine whether a habitat occurs in the Action Area).

**Table 4-10: Species Sub-Group Habitats within Action Area**

| Species Group/Sub-Group | Habitat is in Action Area? |
|---|---|
| Mammals | |
| Wetland Mammals | Yes |
| Nearshore Marine Mammals | Yes |
| Offshore Marine Mammals | No |
| Beach Mammals | Yes |
| Barren Land Mammals | Yes |
| Rangeland Mammals | Yes |
| Forest Land Mammals | Yes |
| Perennial Snow or Ice Mammals | No[1] |
| Birds | |
| Forested Wetland Birds | Yes |
| Nonforested Wetland Birds | Yes |
| Freshwater Birds | Yes |
| Nearshore Marine Birds | Yes |
| Offshore Marine Birds | No[2] |
| Beach Birds | Yes |
| Rangeland Birds | Yes |
| Forest Land Birds | Yes |
| Reptiles | |
| Wetland Reptiles | Yes |
| Offshore Marine Reptiles | No[3] |
| Inland Sandy Area Reptiles | Yes |
| Rangeland Reptiles | Yes |
| Evergreen Forest Reptiles | Yes |
| Amphibians | |
| Wetland Amphibians | Yes |
| Freshwater Amphibians | Yes |
| Cave Amphibians | Yes |
| Forest Land Amphibians | Yes |
| Fish | |
| Freshwater Resident Fish | Yes |
| Nearshore Marine Fish | Yes |
| Anadromous Fish | Yes |
| Cave Fish | Yes |
| Invertebrates | |
| Forested Wetland Invertebrates | Yes |
| Nonforested Wetland Invertebrates | Yes |
| Freshwater Invertebrates | Yes |
| Nearshore Marine Invertebrates | Yes |
| Beach Invertebrates | Yes |
| Barren Land Invertebrates | Yes |
| Cave Invertebrates | Yes |
| Rangeland Invertebrates | Yes |
| Forest Land Invertebrates | Yes |
| Plants | |
| Forested Wetland Plants | Yes |
| Nonforested Wetland Plants | Yes |
| Freshwater Plants | Yes |
| Nearshore Marine Plants | Yes |

| Species Group/Sub-Group | Habitat is in Action Area? |
|---|---|
| Beach Plants | Yes |
| Inland Sandy Area Plants | Yes |
| Rangeland Plants | Yes |
| Forest Land Plants | Yes |

[1] Although perennial snow or ice habitat does not occur in the Action Area, the polar bear will sometimes forage in estuaries, which do.

[2] Although offshore marine waters do not occur in the Action Area, the spectacled eider nests in nonforested wetlands (sedge or grass marshes near shorelines) and the short-tailed albatross nests on beaches, both of which do.

[3] Although offshore marine waters do not occur in the Action Area, sea turtles nest on beaches, which do.

# 5 ESSENTIAL FISH HABITAT ASSESSMENT

## 5.1 Introduction

In this document, primarily to improve readability, EFH is defined as designated essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act.

Productive commercial and recreational fisheries in the U.S. are linked to healthy marine habitats, which in turn support local fishing communities. Pursuant to Section 303(a)(7) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA; P. Law 94-265) (National Marine Fisheries Service, 2007b), as amended by the Sustainable Fisheries Act of 1996 (P. Law 104-267), regional Fishery Management Councils (FMCs) must prepare Fishery Management Plans (FMPs) which include the identification of Essential Fish Habitat (EFH) used by all life history stages of each managed species. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity… 'Waters' includes aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; 'substrate' includes sediment, hard bottom, structures underlying the waters, and associated biological communities; 'necessary' means the habitat required to support a sustainable fishery and a healthy ecosystem; and 'spawning, breeding, feeding, or growth to maturity' covers a species' full life cycle." (National Marine Fisheries Service, 2004).

To provide additional focus for conservation efforts, a HAPC is identified for those EFHs judged to be particularly important to the long-term productivity of populations of one or more managed species, or to be particularly vulnerable to degradation. HAPCs may be a general habitat type in a particular region (e.g., all escarpments and slopes between 40-280 meters deep), or may be a specific location (e.g., the Ten-Fathom Ledge in Key West, Florida) (National Marine Fisheries Service, 2001).

Under the MSA, Congress mandated the identification of habitats essential to managed species and measures to conserve and enhance these habitats. NOAA Fisheries and the eight regional FMCs, under the authority of the Secretary of Commerce, are mandated to describe and identify EFH in each FMP; minimize to the extent practicable the adverse effects of commercial fishing on EFH; and identify other actions to encourage the conservation and enhancement of EFH (50 C.F.R. § 600.805-930). NOAA Fisheries and the regional FMCs also identify HAPCs (National Marine Fisheries Service, 2015b). The MSA requires cooperation among NOAA Fisheries, the regional FMCs, and Federal and State agencies to protect, conserve, and enhance EFH.

Pursuant to Section 305(b)(2) of the MSA, a Federal agency must consult with NOAA Fisheries on all activities, or proposed activities, authorized, funded, or undertaken that might adversely affect EFH. As part of the EFH consultation process, Federal agencies must prepare a written EFH Assessment describing the effects of that action on EFH. An EFH Assessment is a necessary component for efficient and effective consultations between a Federal action agency and NOAA Fisheries. NOAA Fisheries recommends consolidated EFH consultations with interagency coordination procedures required by other statutes such as NEPA, Section 7 of the ESA, or the Fish and Wildlife Coordination Act. NOAA Fisheries must provide the Federal agency with EFH consultation recommendations for any action that may adversely affect EFH (50 C.F.R. § 600.805-930).

## 5.2 National Distribution of EFH

Eight regional FMCs have jurisdiction within the Action Area, defined in this BE as the jurisdiction of the NFIP participating communities, including those areas in the United States and its territories

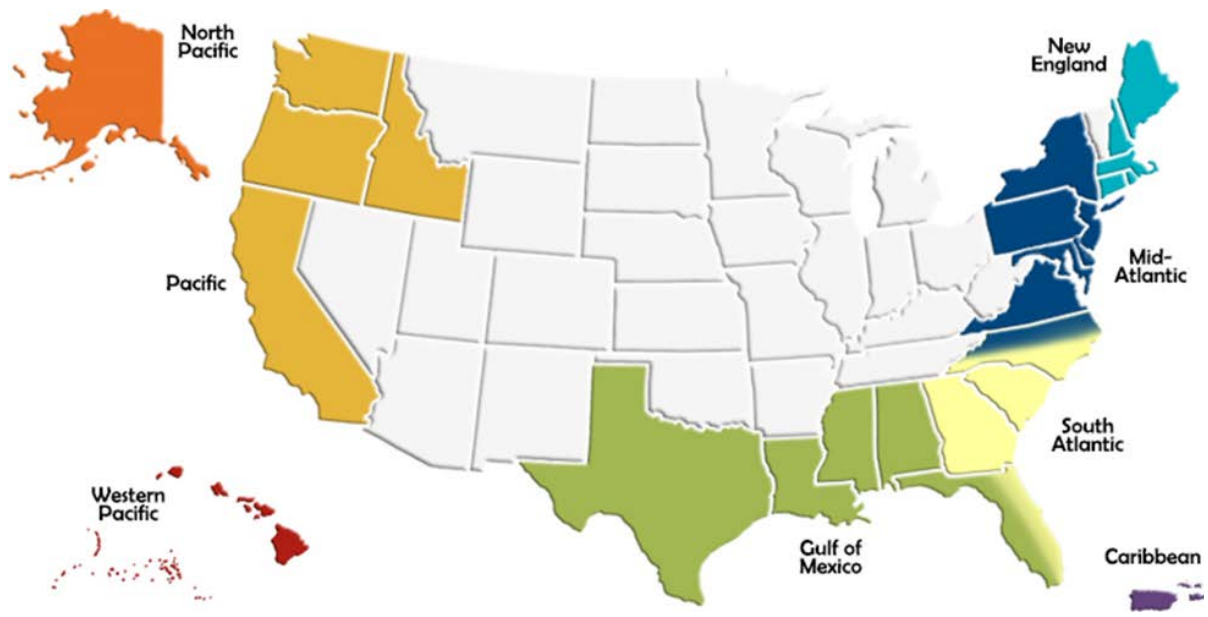
designated as SFHAs on a FIRM under the NFIP and the nearshore marine waters[20] that may be affected by the Proposed Action within the mapped SFHA. Secretarial FMPs have been developed by NOAA Fisheries for highly migratory species that may occupy waters under the jurisdiction of multiple FMCs. The geographic regions within the Action Area over which these regional FMCs have jurisdiction are shown in Figure 5-1 and described below.

- **Pacific FMC:** The Pacific FMC regulates the anadromous and marine fish resources of California, Oregon, Washington, and Idaho. The Pacific FMC has designated marine and estuarine waters as EFH for federally managed groundfish (Pacific Fishery Management Council, 2014a), coastal pelagic species (Pacific Fishery Management Council, 2011), and Pacific salmon (Pacific Fishery Management Council, 2014b) along and to the west of the California, Oregon, and Washington coasts. EFH for Pacific salmon extends into freshwater streams and rivers within the region, including waters used by anadromous fish in Idaho.
- **Western Pacific FMC:** The Western Pacific FMC has responsibility for the marine fish resources of Samoa, Guam, Hawaii, and the Mariana Islands. EFH designated marine and estuarine waters in the FMC include federally managed groundfish, precious corals, and coral reef fish (National Marine Fisheries Service, 2015c).
- **North Pacific FMC:** The anadromous and marine fish resources of Alaska are under the jurisdiction of the North Pacific FMC. The North Pacific FMC has established EFH in the marine and estuarine waters along and offshore of the Alaska coast, including the Aleutian Islands and includes EFH in marine and estuarine waters for federally managed weathervane scallops, salmon, crabs, and groundfish (National Marine Fisheries Service, 2015c). EFH for North Pacific salmon extends into freshwater streams and rivers within the region.
- **New England FMC:** The New England FMC regulates the anadromous and marine fish resources of Maine, Massachusetts, New Hampshire, Rhode Island, and Connecticut. The New England FMC has designated marine and estuarine waters as EFH for federally managed groundfish, whiting, Atlantic herring, Atlantic salmon, sea scallop, skates, red crab, spiny dogfish, and monkfish along and to the east of the New England coast. EFH for Atlantic salmon extends into freshwater stream and rivers within the region; several rivers in Maine are of particular importance for these fish (New England Fishery Management Council, 2015).
- **Mid-Atlantic FMC:** Marine fish resources of New York, New Jersey, Delaware, Pennsylvania, Virginia, and North Carolina are under the jurisdiction of the Mid-Atlantic FMC. The Mid-Atlantic FMC has designated marine and estuarine waters as EFH for federally managed summer flounder, scup, black sea bass, Atlantic mackerel, squid, butterfish, bluefish, ocean quahog, surf clam, monkfish, golden tilefish, and spiny dogfish along and to the east of the New York, New Jersey, Delaware, Virginia, and North Carolina coasts. The monkfish and spiny dogfish fisheries are jointly managed with the New England FMC (Mid-Atlantic Fishery Management Council, 2015).
- **South Atlantic FMC:** The South Atlantic FMC is responsible for the marine fish resources along and offshore of the eastern coasts of Florida, Georgia, and South Carolina. The South Atlantic FMC has designated marine and estuarine wasters as EFH for federally managed coastal migratory pelagic species, corals, golden crab, snapper grouper, and spiny lobster (South Atlantic Fishery Management Council, 2015).

[20] Nearshore marine waters are defined here as waters within a few hundred feet of the shoreline.

- **Gulf of Mexico FMC:** The Gulf of Mexico FMC regulates marine fish resources along and offshore of the coasts of Texas, Louisiana, Mississippi, Alabama, and western Florida. EFH has been designated in marine and estuarine waters for federally managed coastal migratory pelagic species, corals, red drum, shrimp, spiny lobster, and several reef fish (National Marine Fisheries Service, 2015c). The five States within this FMC have Federal Coastal Zone Management (CZM) programs designed to protect, restore, and responsibly develop coastal communities (National Oceanic and Atmospheric Administration, 1999) Puerto Rico and the U.S. Virgin Islands are managed by the Caribbean FMC (National Oceanic and Atmospheric Administration Southeast Regional Office, 2010). The Caribbean FMC has designated marine and estuarine waters as EFH for federally managed queen conch, pelagic and benthic fish species, several reef fish, spiny lobster, and coral (National Marine Fisheries Service, 1999c).

**Figure 5-1: Regional Fishery Management Councils**




Source: (National Marine Fisheries Service, 2015d)

Secretarial FMPs have been developed by NOAA Fisheries for highly migratory species and include Amendment 1 to the Atlantic Billfish Fishery Management Plan and the Final Fishery Management Plan for Atlantic Tuna, Swordfish, and Sharks (National Marine Fisheries Service, 1999a) (National Marine Fisheries Service, 1999b). Highly migratory species are managed by the Highly Migratory Species Division, NOAA Fisheries (Pacific Fishery Management Council, 2003).

## 5.3 EFH Designations, Categories, and Descriptions

The information available for almost all EFH designations consists primarily of broad geographic distributions based on specific survey samples, which have not been linked with habitat characteristics. It is difficult to precisely define the habitat type (and its location) for each life stage of each managed species in terms of oceanographic (temperature, salinity, nutrient, current), trophic (presence of food, absence of predators), and physical (depth, substrate, latitude, and longitude) characteristics. Consequently, EFH designations are often defined by the species' position in the water column (e.g., demersal or pelagic), broad biogeographic and bathymetric areas (e.g., 100-200 meter zone), and occasional references to known bottom type associations (e.g., sand or rocky shelf) (National Marine Fisheries Service, 2007b).

In general, marine and estuarine habitats for EFH species are any ocean or estuarine waters or substrate necessary for the fish to spawn, breed, feed, or mature; these habitats include nearshore and offshore waters and extend from the shoreline to the Exclusive Economic Zone (EEZ), which is the area between 3 nautical miles (or 9 nautical miles, in the case of Texas, western Florida, and Puerto Rico) and 200 nautical miles of ocean that extend from the U.S. coast, or the coast of any territory over which the U.S. exercises sovereignty. Within the EEZ, the U.S. has the right to conserve and manage the natural resources of those waters and substrates, including implementation of the MSA (National Oceanic and Atmospheric Administration, 2015a). Exceptions to the EEZ boundary include continental shelf resources that may extend beyond the 200 nautical miles and any freshwater resources throughout an anadromous species' migratory range, except when that species is found in the freshwater resources of a foreign nation.

The information used to help determine the EFH categories described here was developed from a review of governmental, academic, and private sources, as well as best professional judgment by a team of biologists and ecologists. Species and populations were assigned to EFH categories based on the primary habitat used, even though some species may use other habitats at various times. Primary habitat is defined here as the habitat classification that meets most or all of a species' physical and biological needs for most or all of its life cycle.

To concisely describe the EFH designations at a national level, they have been grouped into the six categories (Table 5-1) and described in the following sections. Table 5-1 also notes which habitat classifications (described in Section 4.1) are components of each EFH category, whether a category supports ESA species, and if the habitats designated as a component of an EFH category occur in the Action Area (see Sections 4.2 and 4.3 for a discussion of how these determinations were made).

**Table 5-1: EFH Categories and Component Habitat Classifications within the Action Area**

| EFH Category and Component Habitat Classifications[1] | Supports Listed/ Proposed Species or Designated/Proposed Critical Habitat or EFH?[2] | Occurs within the Action Area? |
|---|---|---|
| Anadromous EFH | | |
| Forested Wetland | Likely | Yes |
| Nonforested Wetland | Likely | Yes |
| Streams and Rivers | Likely | Yes |
| Lakes | Likely | Yes |
| Estuaries | Likely | Yes |
| Nearshore Marine Waters | Likely | Yes |
| Offshore Marine Waters | Likely | No |

| EFH Category and Component Habitat Classifications[1] | Supports Listed/ Proposed Species or Designated/Proposed Critical Habitat or EFH?[2] | Occurs within the Action Area? |
|---|---|---|
| Nearshore Marine/Estuarine EFH | | |
| Forested Wetland | Likely | Yes |
| Nonforested Wetland | Likely | Yes |
| Estuaries | Likely | Yes |
| Nearshore Marine Waters | Likely | Yes |
| Nearshore Marine/Estuarine Benthic EFH | | |
| Estuaries | Likely | Yes |
| Nearshore Marine Waters | Likely | Yes |
| Offshore Marine Benthic EFH | | |
| Offshore Marine Waters | Unlikely | No |
| Pelagic EFH | | |
| Offshore Marine Waters | Unlikely | No |
| Coral Reef EFH | | |
| Estuaries | Likely | Yes |
| Nearshore Marine Waters | Likely | Yes |

1 Classifications are adapted from the Anderson Land Use Classification System (Anderson, Hardy, Roach, & Witmer, 1976), with minor modifications.

2 The determination that a habitat supports ESA species is based on whether a habitat is the primary habitat used by any ESA species for most of its life cycle and meets most or all of that species' physical and biological needs.

### 5.3.1 Anadromous EFH

EFH is designated for several species of anadromous fish that migrate into freshwater systems to spawn but spend the majority of their life cycle in the marine environment. EFH for anadromous species includes freshwater areas (e.g. rivers, streams, and forested wetlands); bays and estuaries; and nearshore and offshore marine waters.

The Pacific FMC manages the fisheries for coho, chinook, and Puget Sound pink salmon and has defined EFH for these three species. Freshwater EFH for Pacific salmon includes all those streams, lakes, ponds, wetlands, and other water bodies currently, or historically accessible to salmon in Washington, Oregon, Idaho, and California, except areas upstream of certain impassable man-made barriers, and longstanding, naturally impassable barriers such as large waterfalls (Pacific States Marine Fisheries Commission, 1999).

The North Pacific FMC manages the fisheries for chinook, chum, coho, pink, and sockeye salmon and has defined EFH for these five species. In bays, estuaries, and marine waters, North Pacific salmon EFH extends from the Alaska to the EEZ limit. In freshwater, salmon EFH includes all the lakes, streams, ponds, rivers, wetlands, and other bodies of water that have been historically accessible to salmon in Alaska. The description of EFH also includes areas above artificial barriers, except for certain barriers and dams that fish cannot pass. However, activities that occur above these barriers, and that are likely to affect salmon below the barriers, may be affected by EFH rulings. Table 5-2 summarizes information regarding the FMPs with EFH designations included within the anadromous category.

**Table 5-2: Anadromous EFH**

| Anadromous EFH (by FMP) | Geographic Region (by FMC) | Number of Species in FMP |
|---|---|---|
| Atlantic Salmon | New England | 1 |
| Alaska Salmon | North Pacific | 5 |
| West Coast Salmon | Pacific | 3 |
| Source: (National Oceanic and Atmospheric Administration, 2015e) | | |

The EFH for Atlantic salmon, managed by the New England FMC, is described as all waters currently or historically accessible to Atlantic salmon within the streams, rivers, lakes, ponds, wetlands, and other water bodies of Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut. Oceanic adult Atlantic salmon are primarily pelagic and range from the waters of the continental shelf off southern New England north throughout the Gulf of Maine (New England Fishery Management Council, 1998a).

Some examples of freshwater Habitat Areas of Particular Concern (HAPC) include streams, rivers, lakes, tributaries, and any other freshwater areas that are used by Anadromous species, such as 11 rivers in Maine which the Atlantic salmon is known to use for spawning (New England Fishery Management Council, 1998b) (National Marine Fisheries Service, 2001).

All of the anadromous salmon species mentioned above, with the exception of the pink and Puget Sound pink, have populations that are listed or proposed ESA species. The listed or proposed populations of coho, sockeye, chinook, and chum salmon species are separated into a total of 18 different populations. Of these 18 populations, 4 are endangered and 14 are threatened. The Atlantic salmon has one endangered population. Critical habitat is designated for all ESA listed or proposed populations except for the North Pacific Basin population of coho salmon.

The following threats and conservation measures have been synthesized from information available for several listed or proposed EFH; these threats are considered to be representative for EFH that serves Anadromous fish (Pacific Fishery Management Council, 2014c) (North Pacific Fishery Management Council, 2012) (National Oceanic and Atmospheric Administration, 2014b) (National Marine Fisheries Service Alaska Region, 2011).

- Fishing activities threaten anadromous EFH through the introduction of fishing equipment, removal of salmon prey, and reduction of nutrients due to fewer salmon carcasses in spawning grounds. FMCs place restrictions on gear, time and area closures, and limits on harvesting times to address these threats.
- Commercial fishing methods such as dredging and trawling threaten anadromous EFH by smoothing or suspension of sediments, moving bottom substrate, and removing aquatic plants and organisms. FMCs limit where and how often these disturbances can occur to address these threats.
- Hydropower and flood control dams threaten anadromous EFH by preventing access to spawning grounds. NMFS consults on the construction and maintenance of such structures and may recommend the construction of fish-friendly dams or ancillary structures that allow fish passage.
- Pesticides and other contaminants entering anadromous EFH can threaten the water quality and organism abundance of spawning locations. NMFS may suggest best management practices and consult on the use of pesticides within and near anadromous spawning EFH.

- Urban and suburban development causing a diverse set of effects to Anadromous EFH including increased runoff, loss of riparian zones, and channelization of rivers and streams used for spawning. NMFS may suggest best management practices and encourage comprehensive land-use management plans, removal of unused impervious surfaces, or protecting/restoring riparian zones in EFH areas.
- Mining, both in and out of the water, may threaten anadromous EFH by altering groundwater hydrology, increasing sedimentation, acid mine drainage, and changing the water temperature and oxygen composition. To address this threat NMFS may consult on such activities and request the reclamation of mine waste, restoration of EFH affected by mining, and avoidance of mining in and near EFH.
- Organic and inorganic human waste may affect anadromous EFH by entangling species and introducing toxic substances into the EFH. NMFS may encourage proper trash disposal and refuse plans, including structural controls that collect debris, and educating the public on reducing the amount of trash generated and disposing of trash properly.

### 5.3.2 Nearshore Marine/Estuarine EFH

Nearshore marine/estuarine EFH is designated for a number of fish, sharks, and invertebrate species that use estuaries, bays, and nearshore marine waters. Some examples of nearshore marine/estuarine species with EFH include herring, sardines, sandbar shark, red drum, bull shark, bluefish, and surf clam (National Marine Fisheries Service, 2015c). These species generally spend all or most of their life (egg-larvae-juvenile-adult-spawning) within the estuarine or nearshore marine water column. Nearshore marine/estuarine habitat includes the open waters of estuaries and bays, and nearshore marine waters along the surf zone and shoreline. Estuarine habitats also include intertidal habits associated with bays and estuaries such as nonforested wetlands (e.g. salt marsh and mud flats), forested wetlands (e.g. mangrove forest), and estuarine and aquatic plant and algal beds (seagrass, kelp, etc.). EFH for nearshore marine/estuarine species is managed by the Gulf of Mexico, Mid-Atlantic, New England, North Pacific, and South Atlantic FMCs. Table 5-3 summarizes information regarding the FMPs with EFH designations included within the nearshore marine/estuarine category.

**Table 5-3: Nearshore Marine/Estuarine EFH**

| Nearshore Marine/Estuarine EFH (by FMP) | Geographic Region (by FMC) | Number of Species in FMP |
|---|---|---|
| Coastal Migratory Pelagics of the Gulf of Mexico | Gulf of Mexico | 3 |
| Gulf of Mexico Red Drum | Gulf of Mexico | 1 |
| Consolidated Atlantic Highly Migratory Species—Nearshore Pelagic Sharks | Highly Migratory Species | 16 |
| Atlantic Bluefish | Mid-Atlantic | 1 |
| Atlantic Mackerel, Squid, and Butterfish | Mid-Atlantic | 4 |
| Atlantic Herring | New England | 1 |
| Fish Resources of the Arctic Management Area | North Pacific | 3 |
| Sources: (National Oceanic and Atmospheric Administration, 2015e) (National Marine Fisheries Service, 2008a) | | |

Nearshore marine/estuarine HAPCs include, but are not limited to, coastal inlets, high salinity surf zones, mangrove and seagrass habitat, kelp beds, Biscayne Bay (Florida), and entire estuaries such as San Francisco Bay (South Atlantic Fishery Management Council, 2014a) (South Atlantic Fishery Management Council, 2014b) (Pacific Fishery Management Council, 2005) (National Marine Fisheries Service, 2001).

Of the species that have nearshore marine/estuarine EFH, one is an ESA species, the scalloped hammerhead shark. This highly migratory species is endangered (U.S. Fish and Wildlife Service, 2014j); critical habitat has not been designated for this species (U.S. Fish and Wildlife Service, 2015c).

The following threats and conservation measures have been synthesized from information available for several listed or proposed EFH; these threats are considered to be representative for EFH that supports nearshore marine/estuarine fish and invertebrates (Pacific Fishery Management Council, 1998).

- Fishing activities threaten nearshore marine/estuarine EFH through over-harvesting and the introduction of fishing equipment. FMCs place restrictions on gear, time and area closures, and limits on harvesting times to address these threats.
- Wastewater discharge threatens nearshore marine/estuarine EFH by introducing nutrients and contaminates which leads to a degradation of water quality. To address this threat, NMFS may consult on wastewater management programs and request outfalls be placed offshore.
- Water intake structures can threaten nearshore marine/estuarine EFH by entrapment of fish and loss of prey species. To mitigate these threats, NMFS may request facilities be placed away from productive areas, restricting fish and prey species that are entrapped, and regulating the temperature of discharge.
- Urban development in coastal areas can threaten nearshore marine/estuarine EFH by increasing contaminant and sediment runoff and filling in aquatic areas. To address these threats, NMFS may consult on shoreline construction or fill placement in EFH, and encourage development of spill response plans, training, and prevention.

### 5.3.3 Nearshore Marine/Estuarine Benthic EFH

Nearshore marine/estuarine benthic fish and invertebrates live on, in, or near the bottom of shallow waters of bays and estuaries and nearshore marine waters, often in areas shallow enough to support photosynthesis. Some examples of nearshore marine/estuarine benthic species with EFH include yelloweye rockfish, Guam and Hawaii bottomfish, sea scallop, thorny skate, and summer flounder. Nearshore marine/estuarine benthic EFH includes many types of bottom habitats, such as submerged banks, benthic algae, kelp beds, seagrass beds, sand/shell bottoms, soft and hard bottoms, and gravel/cobble substrate. Nearshore marine/estuarine benthic EFH also includes rocky reefs (submerged rock outcrops and boulder fields) found at a range of relief and depths that provide shelter, and sometimes a food source with the colonization of algae, for small and juvenile fish as well as invertebrates and fish species.

Nearshore marine/estuarine benthic habitats also include the water-sediment interface used primarily by juvenile and adult invertebrates. The water-sediment interface is generally composed of the areas from the seafloor into the sediment to a depth of one meter.

Nearshore marine/estuarine benthic species generally spend all or most of their life cycle (egg-larvae-juvenile-adult-spawning) at the seafloor, although some species have a planktonic egg or larval stage in the water column that allows dispersal. EFH for nearshore marine/estuarine benthic species within the EEZ is managed by all eight FMCs. Table 5-4 summarizes information regarding the FMPs with EFH designations included within the nearshore marine/estuarine benthic category.

Nearshore marine/estuarine benthic HAPCs include, but are not limited to, benthic areas with gravel/cobble substrate, nearshore hard bottom areas, kelp beds, seagrass beds, live bottom habitats such as soft coral or sponge beds, and living substrates in shallow waters (National Marine Fisheries Service, 2001).

Three nearshore marine/estuarine benthic fish with EFH are ESA listed or proposed; one is endangered and two are threatened. Critical habitat has been designated for all three species.

**Table 5-4: Nearshore Marine/Estuarine Benthic EFH**

| Nearshore Marine/Estuarine Benthic EFH (by FMP) | Geographic Region (by FMC) | Number of Species in FMP |
|---|---|---|
| Stone Crab | Gulf of Mexico | 2 |
| Gulf of Mexico Shrimp | Gulf of Mexico | 6 |
| Consolidated Atlantic Highly Migratory Species—Nearshore Benthic Sharks | Highly Migratory Species | 2 |
| Atlantic Surfclam and Ocean Quahog | Mid-Atlantic | 2 |
| Gulf of Alaska Groundfish | North Pacific | 28 |
| Pacific Coast Groundfish | Pacific | 89 |
| South Atlantic Shrimp | South Atlantic | 5 |
| Sources: (National Oceanic and Atmospheric Administration, 2015e) (Pacific Fishery Management Council, 2003) (National Oceanic and Atmospheric Administration Office of Sustainable Fisheries, 2015) (National Marine Fisheries Service, 2008a) | | |

The following threats and conservation measures have been synthesized from information available for several listed or proposed EFH; these threats are considered to be representative for EFH occupied by nearshore marine/estuarine benthic fish and invertebrates (Pacific Fishery Management Council, 1998).

- Fishing activities threaten nearshore benthic EFH through over-harvesting and the introduction of fishing equipment. FMCs place restrictions on gear, time and area closures, and limits on harvesting times to address these threats.
- Commercial fishing methods such as dredging and trawling threaten nearshore benthic EFH by disturbing and changing the bottom habitat, smoothing or suspension of sediments, increase in turbidity, removing bottom substrate and benthic biological characteristics, and changing the direction or velocity of water flow. FMCs limit where and how often these disturbances can occur to address these threats.
- Urban development in coastal areas can threaten nearshore benthic EFH by increasing contaminant and sediment runoff and the placement of fill in aquatic areas. To address these threats, NMFS may consult on shoreline construction in EFH, encourage development of spill response plans, training, and prevention, and restrict fills.

### 5.3.4 Offshore Marine Benthic EFH

Offshore marine benthic fish and invertebrates live on, in, or near the bottom of deeper, offshore marine waters that are typically too deep to support photosynthetic organisms. Some examples of offshore marine benthic species with EFH include spiny dogfish, Arctic cod, ocean quahog, and snow crab. Offshore benthic EFH occurs in all oceans which border the U.S. and its territories, and includes many types of bottom habitats, including submerged canyons, and the continental shelf and slope. Seamounts (submerged mountains) in offshore marine waters are a particularly important type of rocky reef and provide a productive and nutrient-rich environment in otherwise nutrient-deprived deep open ocean waters (National Oceanic and Atmospheric Administration West Coast Region, 2015). Offshore marine benthic habitats also include the water-sediment interface used primarily by juvenile and adult invertebrates, such as clams, marine worms, and burrowing crustaceans. The water-sediment interface is generally composed of the areas from the seafloor into the sediment to a depth of one meter (North Pacific Fishery Management Council,

2014). Offshore marine benthic species generally spend all or most of their life cycles (egg-larvae-juvenile-adult-spawning) at or near the sea floor, although some species have a planktonic egg or larval stage in the water column that provides a means of dispersal. All eight FMCs manage EFH for offshore marine benthic species within the EEZ. The U.S. has the right to conserve and manage offshore marine benthic habitats within the EEZ and, in accordance with MSA Section 101, continental shelf resources that may be located beyond the EEZ. Table 5-5 summarizes information regarding the FMPs with EFH designations included within the offshore benthic category.

Offshore marine benthic HAPCs include, but are not limited to, benthic areas with gravel/cobble substrate, benthic Sargassum beds, offshore hard bottom areas, and living substrates in deep waters (National Marine Fisheries Service, 2001).

There are no offshore marine benthic fish with EFH that are also ESA species.

**Table 5-5: Offshore Marine Benthic EFH**

| Offshore Marine Benthic EFH (by FMP) | Geographic Region (by FMC) | Number of Species in FMP |
|---|---|---|
| Consolidated Atlantic Highly Migratory Species – Offshore Benthic Sharks | Highly Migratory Species | 4 |
| Spiny Dogfish | Mid-Atlantic | 1 |
| Summer Flounder, Scup, and Black Sea Bass | Mid-Atlantic | 3 |
| Tilefish | Mid-Atlantic | 1 |
| Atlantic Sea Scallop | New England | 1 |
| Monkfish | New England | 1 |
| New England Multispecies | New England | 25 |
| New England Skate | New England | 7 |
| Red Crab | New England | 1 |
| Alaska Scallops | North Pacific | 1 |
| Bering Sea/Aleutian Island Groundfish | North Pacific | 24 |
| Bering Sea/Aleutian Island King and Tanner Crabs | North Pacific | 5 |
| Calico Scallop | South Atlantic | 1 |
| South Atlantic Golden Crab | South Atlantic | 3 |
| Bottomfish and Seamount Groundfish of the Western Pacific Region | Western Pacific | 22 |
| Sources: (National Marine Fisheries Service, 2008a) (National Oceanic and Atmospheric Administration, 2015e) (National Oceanic and Atmospheric Administration Office of Sustainable Fisheries, 2015) | | |

The following threats and conservation measures have been synthesized from information available for several listed or proposed EFH; these threats are considered representative for EFH used by offshore marine benthic fish and invertebrates (Pacific Fishery Management Council, 1998).

- Improperly managed commercial or recreational fishing activities threaten offshore marine benthic EFH through over-harvesting and the entanglement of wildlife with fishing equipment. FMCs place restrictions on gear, time and area closures, and limits on harvesting times to address these threats.
- Commercial fishing methods such as dredging and trawling threaten offshore marine benthic EFH by disturbing and changing the bottom habitat, smoothing or suspension of sediments, increasing turbidity, removing bottom substrate and benthic biological

characteristics, and changing the direction or velocity of water flow. FMCs limit where and how often these disturbances can occur to address these threats.

- Oil and gas exploration threatens offshore marine benthic EFH through the seismic surveys used to identify oil and gas deposits, the installation and use of anchors, pipes, platform legs, etc., and the discharge of drilling muds. These activities cause the fish inhabiting the area to disperse, suspend sediments, increase turbidity, deplete oxygen, and introduce toxins and contaminants to the environment. To address these threats NMFS may encourage development of spill response plans, training, and prevention and request avoidance of highly productive fishing areas to the extent possible.

### 5.3.5 Pelagic EFH

Pelagic EFH consists of offshore marine waters and is designated for a number of pelagic species (those that primarily live in the water column away from the bottom). Some examples of pelagic species with EFH include tuna, pelagic sharks, billfish, and wahoo (National Marine Fisheries Service, 2015c). Pelagic EFH in the EEZ includes offshore marine waters associated with features such as seamounts, submerged banks and canyons, floating algal beds (Sargassum), and the continental shelf. Locations of pelagic species populations within the water column are highly dependent on and shift seasonally in response to water temperatures. In addition, many pelagic species migrate vertically within the water column on a daily basis to feed or avoid predation (Pacific Fishery Management Council, 2011). Pelagic species generally spend all or most of their life cycle (egg-larvae-juvenile-adult-spawning) within the marine water column. The Mid-Atlantic, New England, Pacific, and South Atlantic FMCs manage EFH for pelagic species within the EEZ. Table 5-6 summarizes information regarding the FMPs with EFH designations included within the pelagic category.

**Table 5-6: Pelagic EFH**

| Pelagic EFH (by FMP) | Geographic Region (by FMC) | Number of Species in FMP |
|---|---|---|
| Consolidated Atlantic Highly Migratory Species – Tuna | Highly Migratory Species | 5 |
| Consolidated Atlantic Highly Migratory Species – Swordfish | Highly Migratory Species | 1 |
| Consolidated Atlantic Highly Migratory Species – Offshore Pelagic Sharks | Highly Migratory Species | 13 |
| Consolidated Atlantic Highly Migratory Species – Billfish | Highly Migratory Species | 4 |
| U.S. West Coast Fisheries for Highly Migratory Species | Pacific | 13 |
| Dolphin and Wahoo | South Atlantic | 2 |
| Pelagic Sargassum Habitat | South Atlantic | 1 |
| Pelagic Fisheries of the Western Pacific Region | Western Pacific | 18 |
| Sources: (National Marine Fisheries Service, 2008a) (National Oceanic and Atmospheric Administration, 2015e) (National Oceanic and Atmospheric Administration Office of Sustainable Fisheries, 2015) | | |

Pelagic HAPCs include, but are not limited to, pelagic Sargassum beds, banks in the EEZ that are shallower than 2,000 meters, and the water column to a depth of 1,000 meters that is above seamounts (Western Pacific Regional Fishery Management Council, 2004) (South Atlantic Fishery Management Council, 2014a) (National Marine Fisheries Service, 2001).

No pelagic species that have EFH are ESA species.

The following threats and conservation measures have been synthesized from information available for several listed or proposed EFH; these threats are considered to be representative for EFH used by pelagic fish (Pacific Fishery Management Council, 1998) (South Atlantic Fishery Management Council, 2014a).

- Fishing activities threaten pelagic EFH through over-harvesting and the introduction of fishing equipment. FMCs place restrictions on gear, time and area closures, and limits on harvesting times to address these threats.
- Oil and gas exploration threatens pelagic EFH through the seismic surveys that identify oil and gas deposits, the installation and use of anchors, pipes, platform legs, etc., and the discharge of drilling muds. These effects will cause the fish inhabiting the area to disperse, suspend sediments, increase turbidity, deplete oxygen, and introduce toxics and contaminants. To address these threats NMFS may encourage development of spill response plans, training, and prevention, and request avoidance of highly productive fishing areas to the extent possible.
- The discharge or spill of oil or other hazardous substances into the marine environment affects pelagic EFH by removing or degrading fish resources and prey. To minimize these effects, NMFS may encourage the development of spill response plans, training, and prevention.
- The harvest and collection of Sargassum disturbs pelagic EFH and threatens the habitat composition and availability of resources. To address this threat, FMCs restrict harvesting areas and times or require an official observer be present during harvesting.

### 5.3.6 Coral Reef EFH

EFH is designated for coral reef ecosystems and several fish and invertebrates that reside in coral or artificial reefs in marine nearshore waters and nearshore waters of bays and estuaries. Some examples of reef species with EFH include the spiny lobster, queen conch, rainbow parrotfish, reef sharks, and sand tilefish. Note that artificial reefs are placed in places where coral reefs used to be.

Characteristics of coral reefs are the presence of living and dead coral, calcium carbonate deposits, and high biodiversity (National Marine Fisheries Service, 1999c). Coral reefs can be found in nearshore tropical or temperate marine waters in a wide range of latitudes and depths, although they are most common in tropical, shallower waters (National Oceanic and Atmospheric Administration, 2015b). Because of their high biodiversity, coral reefs provide food, shelter, and breeding opportunities for a number of fish and invertebrate species. Reef corals represent a unique situation since in most cases they comprise the main component of their own habitat, the coral reef. Therefore, the condition of the coral species reflects the condition of their habitat. If corals are dead or dying, the coral reef is likely to degenerate. Many other organisms, including commercially important species (e.g., spiny lobster, rockfish, and grouper), rely on corals, directly or indirectly, for shelter, food and as spawning sites (Goenaga & Boulon, Jr., 1992).

Artificial reefs include human-made structures that provide three-dimensional relief above the seafloor. Artificial reefs are physical enhancements of the seafloor by purposeful or incidental deposition of various types of materials; such as shipwrecks and concrete structures placed on the seafloor. Artificial reefs provide shelter and feeding opportunities for a variety of fish species, as well as surface area for settlement, attachment, and colonization by benthic organisms, and are often used to enhance habitat in areas where natural reefs have been degraded. The value of artificial or structured habitat generally increases over time as epibenthic plants and animals, and finfish such as reef-dwelling demersal species, planktivores, and piscivores, colonize the reef. Juvenile and adult life stages of fish use these reefs for protection, orientation, and as feeding areas. Adult fishes may also use the habitat as a spawning site.

Reef inhabitants generally spend all or most of their life (egg-larvae-juvenile-adult-spawning) within the reef environment. The South Atlantic, Gulf of Mexico, Western Pacific, and Caribbean FMCs have FMPs in place for all of the coral reef ecosystems; these ecosystems provide habitat for a variety of coral species and several hundred fish and invertebrate species. Some examples of reef habitats managed by these FMCs include soft and hard coral reefs, live/hard bottoms, and aquacultured live rock (National Oceanic and Atmospheric Administration Southeast Regional Office, 2015a). Table 5-7 summarizes information regarding the FMPs with EFH designations included within the reef category.

Reef HAPCs include, but are not limited to, coral reefs off the central east coast of Florida, artificial reefs in the south Atlantic, the Dry Tortugas coral reef in Florida, and some coral reefs in California and the Hawaiian Islands (National Oceanic and Atmospheric Administration West Coast Region, 2015) (National Marine Fisheries Service, 2001).

**Table 5-7: Reef EFH**

| Reef EFH (by FMP) | Geographic Region (by FMC) | Number of Species in FMP |
|---|---|---|
| Corals and Reef-Associated Invertebrates of Puerto Rico and the U.S. Virgin Islands | Caribbean | unknown * |
| Queen Conch Resources of Puerto Rico and the U.S. Virgin Islands | Caribbean | 9 |
| Reef Fish Fishery of Puerto Rico and the U.S. Virgin Islands | Caribbean | 84 |
| Spiny Lobster Fishery of Puerto Rico and the U.S. Virgin Islands | Caribbean | 1 |
| Coral and Coral reefs of the Gulf of Mexico | Gulf of Mexico | unknown * |
| Gulf of Mexico Spiny Lobster | Gulf of Mexico | 2 |
| Reef Fish Resources of the Gulf of Mexico | Gulf of Mexico | 32 |
| Consolidated Atlantic Highly Migratory Species—Reef Sharks | Highly Migratory Species | 2 |
| Coral, Coral Reefs, and Live/hard Bottom Habitats of the South Atlantic Region | South Atlantic | unknown * |
| South Atlantic Spiny Lobster | South Atlantic | 2 |
| South Atlantic Snapper-Grouper | South Atlantic | 70 |
| Coral Reef Ecosystems of the Western Pacific Region | Western Pacific | unknown * |
| Crustaceans Fisheries of the Western Pacific Region | Western Pacific | 2 |
| Precious Corals Fisheries of the Western Pacific Region | Western Pacific | 12 |

* Number of species is very large, but unknown because the FMP covers entire coral reef ecosystems.

Sources: (National Oceanic and Atmospheric Administration, 2015e) (National Oceanic and Atmospheric Administration Southeast Regional Office, 2010) (National Oceanic and Atmospheric Administration Office of Sustainable Fisheries, 2015) (Western Pacific Regional Fishery Management Council, 1979) (National Marine Fisheries Service, 2008a)

Within the reef EFH, 22 coral species are ESA listed or proposed as threatened. Critical habitat has been designated for two of these species. Most of the 22 species were listed or proposed on September 10, 2014, when NOAA Fisheries published a final rule listing 20 coral species as threatened under the ESA (National Oceanic and Atmospheric Administration Southeast Regional Office, 2015b). No reef fish or crustacean species that have EFH are ESA listed or proposed.

The following threats and conservation measures have been synthesized from information available for several listed or proposed EFH; these threats are considered to be representative for EFH that includes reefs and reef fish and invertebrates (National Oceanic and Atmospheric Administration Office of Protected Resources, 2015a) (National Oceanic and Atmospheric Administration, 2015c) (South Atlantic Fishery Management Council, 2014a) (National Oceanic and Atmospheric Administration, 2015d).

- The fishing and overharvesting of reef fish and invertebrates for use as fishing bait or for human consumption. FMCs place restrictions on gear, time and area closures, and limits on harvesting times to address these threats.
- The collection and trade, both domestic and international, of live reef fish as pets, reef invertebrate shells as jewelry or decorative items, and reef coral as aquarium or display organisms. The harvest and collection of these species disturbs reef EFH and threatens the habitat composition and availability of resources. To address this threat, FMCs restrict harvesting areas and times or require an official observer be present during harvesting.
- Commercial fishing methods such as dredging and trawling threaten reef EFH by disturbing and changing the reef habitat, removing coral and sponges, increasing turbidity, and changing the direction or velocity of water flow. To address these threats, FMCs limit where and how often these disturbances can occur.
- Oil and gas exploration threatens reef EFH through the seismic surveys that identify oil and gas deposits; the installation and use of anchors, pipes, platform legs, etc.; and the discharge of drilling muds. These effects will cause the fish in the area to disperse, suspend sediments, and increase turbidity resulting in a smothering of corals from the drilling muds and introducing toxics and contaminants. To address these threats, NMFS may encourage development of spill response plans, training, and prevention, and request avoidance of highly productive fishing areas to the extent possible.
- The introduction of invasive species into the reef ecosystem from the incidental transport of non-indigenous marine species on ship ballasts and hulls and the accidental or intentional release of exotic species from commercial or home aquariums. Invasive species in a reef ecosystem compete with native reef species for food and habitat resources and can decrease the biodiversity of the reef. To address this threat, NMFS may help create eradication programs or management measures to prevent introduction of invasive species.
- Changes in water temperatures, flow, and tides, which may be influenced by climate change, can threaten reef EFH.

# 6 EFFECTS ANALYSIS

The extent of the Action Area for this BE is the limit of the jurisdictional boundaries of the NFIP participating communities, including those areas in the United States and its territories designated as SFHAs on a FIRM. The FEMA-mapped SFHA is the area where the NFIP's floodplain management regulations must be enforced (Federal Emergency Management Agency, 2014b). Although FEMA's regulatory jurisdiction is limited to the mapped SFHAs, the Action Area assesses all of the areas that may be affected by the Proposed Action.

As described in more detail in Section 4.2, the classification of habitats in this document uses SFHA boundaries as the demarcation line for a basic segregation of habitat types needed to analyze the effects for some parts of the Proposed Action, which may occur outside of SFHAs. The 12 habitat classifications were divided into lowland/aquatic habitats and upland habitats. Lowland/aquatic habitats are generally associated with inland waterways or coastlines and typically overlap partially or completely with SFHAs. These habitats (wetlands, fresh waters, nearshore marine waters, and beaches) are anticipated to have a high prevalence in SFHAs nationwide. Offshore marine waters and upland habitats (barren lands, caves, rangeland, forest land, and perennial snow or ice) are geographically separated from waterways and coastlines and generally have little to no overlap with SFHAs. While upland habitats may sometimes occur within SFHAs, their prevalence in SFHAs nationwide is anticipated to be minimal. Although the effects determination separates effects of the Proposed Action as occurring either within or outside of SFHAs, all effects of the Proposed Action within the Action Area are addressed.

This chapter assesses the potential indirect effects of the Proposed Action on ESA species, designated critical habitats, and EFH. Section 6.1 describes the effects determinations for actions under each element of the Proposed Action (flood insurance, floodplain management (including the CRS), and flood hazard mapping) and includes all existing elements/actions under the NFIP, recent legislative modifications, and proposed program changes to the NFIP.

Although the effects of non-discretionary program components are addressed as part of the Proposed Action, FEMA does not have the ability to modify those components. From its creation and through subsequent amendments, the NFIP has included a mix of direct mandates (providing little or no flexibility) and discretionary actions. Under the ESA Section 7(a)(2), Federal agencies are required to consult only if there is discretionary Federal involvement or control: "…where the Federal agency lacks the discretion to influence the private action … the agency simply does not possess the ability to implement measures that inure to the benefit to the protected species" (50 C.F.R. § 402.03). Therefore, although FEMA has no legal obligation to evaluate non-discretionary actions and their potential indirect effects on ESA-listed species and designated critical habitat, FEMA has consented to assess the effects of all actions under each element, regardless of whether they are discretionary, to provide a comprehensive analysis of the Program.

The Services describe effects determinations (U.S. Fish and Wildlife Service and National Marine Fisheries Service, 1998) as follows.

For listed species/designated critical habitat, the possible effects determinations are as follows:

- No effect (NE) – If the Proposed Action will not affect listed species or designated critical habitat.
- Not likely to adversely affect (NLAA) – If effects on listed species are expected to be discountable, insignificant, or completely beneficial.
- Likely to adversely affect (LAA) – If any adverse effect to a listed species or designated critical habitat may occur as a direct or indirect result of the Proposed Action, or an

interrelated or interdependent action, and the effect is not discountable, insignificant, or beneficial.

For proposed species/proposed critical habitat, the possible effects determinations are:

- No effect (NE).
- Likely to jeopardize the proposed species/adversely modify proposed critical habitat.
- Not likely to jeopardize the proposed species/adversely modify proposed critical habitat.

For EFH consultations, adverse effects are defined as any physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include site-specific or habitat-wide effects, including individual, cumulative, or synergistic consequences of actions (50 C.F.R. § 600.810). For EFH consultations, adverse effects may or may not be considered substantial, which helps determine the level of effect.

The effects analysis in this Chapter is structured as follows:

- Section 6.1: The Effects Determination for the Proposed Action on ESA species, designated critical habitats, and EFH;
- Section 6.2: Interdependent and Interrelated Actions; and
- Section 6.3: Cumulative Effects.

## 6.1 Effects Determination for the Proposed Action

It is important to emphasize that because FEMA does not authorize, fund, or carry out floodplain development, any potential effects of the Proposed Action would necessarily be indirect. Floodplain development itself is not an action under the NFIP, and FEMA does not control the rate or quantity of development in floodplains or the effects those development activities may have on ESA species, designated critical habitats, or EFH. The ESA-implementing regulations define indirect effects as those that are "caused by the Proposed Action and are later in time, but are still reasonably certain to occur" (50 C.F.R. § 402.02). The Proposed Action does not cause development to occur, nor does it play a significant role in facilitating or encouraging floodplain development.

The available research and studies – discussed in Sections 3.5 and 3.6 – suggest that the NFIP is not a significant factor in the determination of whether or not to develop in the floodplain. Research by AIR evaluating the NFIP indicated that the rate at which new buildings are constructed in the floodplain has, if anything, decreased in recent years due to a combination of the NFIP's building elevation requirements, cost of construction in the floodplain, restrictions on floodway development, and the requirement to purchase flood insurance. Studies have also found that NFIP performance standards require participating communities to only allow encroachment in its riverine floodway that would not cause an increase in flood heights (subject to certain regulatory exceptions) (44 C.F.R. § 60.3d and e), have prevented a great deal of development in coastal floodplains and mapped floodways (Wetmore, et al., 2006).

However, certain actions taken under the NFIP–specifically the issuance of certain letters of map change, mapping a levee system as meeting the requirements for accreditation, or designating a levee system in an AR or A99 Zone–are perceived by some to offer some encouragement to develop in the floodplain, and FEMA seeks to undertake program changes to address any potential effects of this action. While the issuance of LOMRs and LOMR-Fs is a non-discretionary

action for which FEMA has no obligation to consult, FEMA proposes to take measures within its discretion to demonstrate that its action in issuing LOMRs and LOMR-Fs is ESA-compliant. FEMA is not responsible for private floodplain development, or for ensuring that such development is compliant with the ESA. However, FEMA does require written assurance of compliance with appropriate sections of 44 C.F.R. § 60.3 be provided by the participating community prior to processing a LOMR or a LOMR-F request.

Currently, FEMA's minimum floodplain management criteria at 44 C.F.R. § 60.3(a)(2) requires communities to, for all floodplain development permits, "review [the] proposed development to ensure that all necessary permits have been received from those governmental agencies from which approval is required by Federal or State law … ." FEMA proposes to issue clarification guidance stating that, under this minimum floodplain management criterion, communities are required to obtain and maintain documentation of compliance with the ESA. Furthermore, FEMA will make program changes in its area of discretionary authority to require the community, or the project proponent on the community's behalf, to produce documentation of compliance with the ESA prior to processing LOMR and LOMR-F requests. By documenting that the associated private floodplain development is ESA-compliant, FEMA can demonstrate that it is only issuing LOMRs or LOMR-Fs for ESA-compliant floodplain development (and, thus, not encouraging floodplain development that adversely impacts ESA-listed species and designated critical habitat). Notably, the LOMC documentation requirement would also cover LOMCs associated with the mapping of levee accreditations, as well as AR zone and A99 zone determinations.

Table 6-1 summarizes FEMA's formal determination of effects on ESA species, designated critical habitats, and EFH, by individual components of the Proposed Action.

**Table 6-1: Effects Determination for the Proposed Action's Indirect Effects on ESA-Listed/Proposed Species, Designated/Proposed Critical Habitat, and Designated EFH within the Action Area**

| NFIP Element | Proposed Action | | Discretion/ No Discretion | Effects Determination |
|---|---|---|---|---|
| | Existing Component | Modification | | |
| Floodplain Management | Implementing Minimum Floodplain Management Criteria | Clarify that pursuant to 44 C.F.R. § 60.3(a)(2), a community must obtain and maintain documentation of compliance with the appropriate Federal and state laws, including the ESA, as a condition of issuing floodplain development permits. | Discretion | NE |
| | Enroll Communities in the NFIP | No change | No discretion | NE |
| | Monitor Communities' Compliance with NFIP via Community Assistance Visits (CAVs)/Community Assistance Contacts (CACs) | No change | Discretion | NE |
| | Compliance Enforcement (e.g., probation, suspension, CRS retrogrades) | No change | Discretion | NE |
| | Administer the Map Adoption Process | No change | No discretion | NE |

| | | | | |
|---|---|---|---|---|
| | Administer Community Rating System (CRS) (includes awarding points for CRS Class ratings) | No change | Discretion | NE |
| | CRS Activity Changes / Updates | No change | Discretion | NE |
| | Training / General Technical Assistance on Minimum Floodplain Management Criteria | No change | Discretion | NE |
| | Removal of Insurance Eligibility (pursuant to Section 1316) | No change | No discretion | NE |
| Flood Hazard Mapping | Decision to Publish Flood Insurance Rate Maps (FIRMs)– decision on level of study performed | No change | Discretion | NE |
| | Development of New or Revised Flood Insurance Studies (FIS) and SFHA Maps – making an FIS, engineering analysis | No change | No discretion | NE |
| | Non-regulatory Products and Features | No change | Discretion | NE |
| | Map Sequencing | No change | Discretion | NE |
| | Letter of Map Amendment (LOMA) and Letter of Determination Review (LODR) | No change | No discretion | NE |
| | Letter of Map Revision (LOMR) and Letter of Map Revision Based on Fill (LOMR-F) | Clarify that certain letter of map change requests will not be issued until the community or project proponent has submitted documentation of compliance with the ESA. | No discretion | NE |
| | Conditional Letter of Map Revision (CLOMR) | No change | Discretion | NE |
| | Conditional Letter of Map Revision Based on Fill (CLOMR-F) | No change | Discretion | NE |
| | Conditional Letter of Map Amendment (CLOMA) | No change | Discretion | NE |
| | Data Development and Dissemination | No change | Discretion | NE |
| | Community Outreach, Training, and General Technical Assistance | No change | Discretion | NE |
| | Implementing Mapping Standards, Policies, and Regulations | No change | Discretion | NE |

| | | | | |
|---|---|---|---|---|
| | Levee Accreditation Process | Associated levee construction, maintenance, repair, etc. would be covered by the new LOMR/LOMR-F requirements. | No discretion | NE |
| | AR Zone-A99 Determinations | Associated levee construction, maintenance, repair, etc. would be covered by the new LOMR/LOMR-F requirements. | No discretion | NE |
| Flood Insurance | Administering the Provision of Flood Insurance | | | |
| | Administer Write-Your-Own (WYO) Programs | No change | No discretion | NE |
| | Develop & Publish Insurance Rate Tables | • Subsidies on certain pre-FIRM properties (non-primary residences, business properties, severe repetitive loss properties, substantially damaged or improved properties, and properties for which the cumulative claims payments exceed the fair market value of the property) would be phased out at a rate of 25% premium rate increases per year.[1]<br>• Subsidies on all other pre-FIRM properties would be phased out through annual premium rate increases of at least 5%, but no more than 15%, per risk classification, with no individual policy exceeding an 18% premium rate increase.[1] | No discretion | NE |
| | Insurance Policy Management (Issue/Sell/Renew/ Refund/Appeal) | No change | No discretion | NE |
| | Educate Insurance Agents | No change | Discretion | NE |
| | Educate and Certify Claims Adjusters | No change | Discretion | NE |
| | Adjust Loss Claims | No change | No discretion | NE |
| | Pay Valid Claims | No change | No discretion | NE |
| | Provide General Technical Assistance | No change | Discretion | NE |
| | Marketing | No change | Discretion | NE |
| NE | No effect | | | |
| 1 | Modifications required by statute | | | |

### 6.1.1 Floodplain Management

Under the floodplain management element, FEMA's role is limited to enrolling communities into the NFIP, establishing the minimum floodplain management criteria, programmatic compliance monitoring and oversight, and providing technical assistance to help ensure that communities are complying with NFIP program requirements. FEMA has discretion over most of the floodplain management activities.

A description of the actions and proposed modifications under the floodplain management program element is provided below.

#### 6.1.1.1 Enroll Communities in the NFIP

Any community meeting the statutory requirements for participation in the NFIP will be allowed to participate; FEMA has no discretion over this action. Communities join the NFIP both before and after the identification of SFHAs, and many communities have SFHA and non-SFHA areas within their jurisdictions.

| | |
|---|---|
| **NE** | Because enrolling a community in the NFIP is a non-discretionary, administrative action, it will have "No Effect" on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.1.2 Administer the Map Adoption Process

Community map adoption is the process of incorporating flood hazard data provided by FEMA into new or existing community floodplain management regulations. The map adoption process ensures that NFIP participating communities have floodplain management ordinances in place that reflect the most updated flood map. The community has six months to incorporate the new data or it will be immediately suspended from the NFIP (44 C.F.R. § 59.24(a)). If a new map incorporates better data, such as a floodway, that could trigger new associated floodplain management requirements. Map adoption is a non-discretionary action and administrative in nature.

| | |
|---|---|
| **NE** | Because the adoption of maps is a non-discretionary, administrative process designed to ensure that the minimum floodplain management requirements reflect the updated flood map, the map adoption process has "No Effect" on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.1.3 Implementing Minimum Floodplain Management Criteria

FEMA has some discretion over the minimum floodplain management criteria, which participating communities must adopt into their local ordinances and enforce as a condition of participation in the NFIP. Floodplain management standards may reduce economic risk through improved building and construction standards. In a study of the NFIP's building standards, AIR found that the NFIP floodplain management regulations and insurance rates tend to promote sound construction practices and reduce potential flood damages (Jones, Coulbourne, Marshall, & Rogers, 2006).

These requirements can act as a disincentive to development because of the increased regulations and restrictions. In its 2006 report on the NFIP's impact on floodplain development, AIR found that implementation of the minimum floodplain management criteria has restrained development in flood hazard areas (American Institutes for Research - Rosenbaum, W. and Boulware, G., 2006).

As stated above, private floodplain development is not a FEMA action. FEMA is not responsible for private floodplain development, or for ensuring that such development is compliant with the ESA. Moreover, the impacts of private floodplain development on ESA listed species are already addressed through Sections 9 and 10 of the ESA. However, FEMA does require written

assurance of compliance with appropriate sections of 44 C.F.R. § 60.3 be provided by the participating community prior to processing a LOMR or a LOMR-F request. Accordingly, as discussed in the preceding section, as part of the program changes to demonstrate that FEMA's action in issuing LOMRs and LOMR-Fs is ESA-compliant, FEMA will clarify its compliance requirements under 44 C.F.R. § 60.3(a)(2). FEMA proposes to clarify that pursuant to 44 C.F.R. § 60.3(a)(2), a community must require documentation of compliance with the appropriate Federal and state laws, including the ESA, as a condition of issuing floodplain development permits.

| | |
|---|---|
| **NE** | While there is strong evidence to suggest that the minimum floodplain criteria act to restrain floodplain development, FEMA has no data or studies to support when and where that floodplain development is being restrained, or whether the floodplain development in question would have otherwise adversely impacted ESA-listed species or designated critical habitat. As such, FEMA can claim no beneficial effects as a result of the implementation of the floodplain management criteria. Additionally, because the proposed change to the minimum floodplain management criteria does not change the existing ESA-related compliance requirements associated with floodplain development permits, but merely documents that such compliance is occurring, the proposed change will have "No Effect" on species listed as threatened or endangered or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.1.4 Administer CRS and CRS Activity Changes/Updates

Under the CRS, NFIP-participating communities can receive credit for implementing measures beyond the NFIP minimum floodplain management to further reduce flood damages or protect the natural and beneficial functions of floodplains. The CRS is largely discretionary, but Section 1315(b) of the NFIA requires that all activities included in the CRS must reduce the risk of flood damage. An explanation of the CRS can be found in Section 3.6 and Appendix B. Some examples of CRS activities that would result in a beneficial effect to ESA species and their habitats are provided below. The effects of each of these CRS activities are described below:

- *Map Information Service (Activity 320):* Credit is available for activities that would advise the public about areas that should be protected because of their natural floodplain functions.
- *Outreach projects (Activity 330):* Credit is available for outreach projects that include descriptions of the natural functions of the community's floodplains.
- *Flood Protection Information (Activity 350):* Credit is available for a website that provides detailed information about local areas that should be protected for their natural floodplain functions and how they can be protected.
- *Open Space Preservation (Activity 420):* Promoting the preservation of lands within SFHAs in coastal ecosystems has the following beneficial effects on ESA species by (1) preserving habitat within or adjacent to the beach/dune and estuarine ecosystem, (2) preserving native vegetation on undisturbed sites, (3) preventing the negative consequences of placing fill materials within or adjacent to the beach/dune and estuarine systems, and (4) reducing the amount of urban runoff that negatively affects aquatic ecosystems. Additionally, in the 2013 CRS update, credits have been increased for open space with bonus credits for open space that has natural and beneficial functions, open space located in areas identified as habitat for listed species, or open space that has been preserved through a restoration plan. The increase in open space credit should also incentivize communities to provide levee setbacks and create additional open space around levees.
- *Higher Regulatory Standards (Activity 430):* Since communities that adopt higher floodplain management standards receive higher credits in the CRS, the elements within

this credit will beneficially affect ESA species, designated critical habitat, and EFH by decreasing the amount of and intensity of development in the coastal SFHA, protecting shoreline habitat, and improving water quality by limiting development within the floodplain.

- *Flood Data Maintenance (Activity 440):* Adding layers to the community's geographic information system with natural floodplain functions (e.g. wetlands, designated riparian habitat, and flood water storage areas) is credited.
- *Stormwater Management (Activity 450):* These criteria beneficially affect ESA species by reducing the amount of sediment and potentially toxic runoff deposited into the waterway thus improving water quality. These criteria are especially beneficial to fragile estuarine ecosystems that are dependent on good water quality for proper maintenance of function. Additionally, in the 2013 CRS update, credits have been added to include an incentive for low impact development techniques.
- *Floodplain Management Planning (Activity 520):* The floodplain management plan may reduce the amount of floodplain development within a community through recognition of flood hazards and methods to mitigate those hazards. The preparation of a floodplain management plan does not necessarily reduce the amount of floodplain development allowed within a community. However, there is an opportunity through the planning effort to recognize the importance of maintenance of natural resources as an important component of floodplain management. Additionally, in the 2013 CRS update, new credit has been added for creating and adopting a plan that includes components such as a habitat conservation plan, riparian habitat preservation and/or restoration plan, green infrastructure plan or an inventory of ecological attributes.
- *Acquisition and Relocation (Activity 530):* A credit bonus is available for buildings that are removed from Zone V and Coastal A Zones and for new environmental review criteria conducted before acquisition or relocation have been implemented to ensure that projects will not have a negative effect on environmental, historical, and cultural resources. Certifications are required for projects initiated after April 1, 2013 to document that communities or project funding agencies are communicating and coordinating with the regulatory agencies responsible for environmental and historic preservation.
- *Flood Protection and Drainage System Maintenance (Activity 540):* These activities credit flood loss reduction measures such as capital improvement systems and drainage improvement projects provided that a thorough environmental review is conducted and documented.
- *Global Changes:* There are nine activities that provide points for natural and beneficial functions and a prerequisite number of points are required in these nine activities for communities to advance to a Class 4 with an additional number of points to advance to a Class 1.

The CRS promotes higher standards for floodplain management and rewards activities that protect the natural and beneficial functions of floodplain. Moreover, through the CRS, FEMA provides incentives to communities, in the form of insurance premium discounts, for implementing good floodplain management practices that protect the habitat of ESA species (Federal Emergency Management Agency, 2010).

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| **NE** | While there is strong evidence to suggest that CRS incentivizes communities to undertake actions that benefit ESA species and designated critical habitat, as well as the natural and beneficial floodplain functions that support such species and habitat, FEMA has no data or studies to support when and where potentially beneficial actions will take place or which CRS activities the community will undertake of the 19 categories of possible creditable activities. Moreover, even actions that are generally considered to benefit species – such as the creation of open space – may not be beneficial if there are no species or habitat in the area to benefit. As such, FEMA can claim no beneficial effects as a result of the implementation of the CRS. Accordingly, FEMA's implementation of the CRS program will have "No Effect" on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.1.5 Training/General Technical Assistance on Minimum Floodplain Management Criteria

FEMA offers technical assistance to communities in complying with the NFIP's floodplain management criteria. A technical assistance contact, which may be done in person or by phone, may require addressing one or more NFIP floodplain management issues in the community. Hundreds of these general technical assistance interactions occur each year; these requests are typically generated through phone calls or e-mails from community officials, complaints from property owners, inquiries from building contractors, and inquiries from insurance agents. Based on the experience of FEMA floodplain managers, most violations result from a community's lack of understanding about the program requirements and/or how to comply with the program requirements. As such, technical assistance is very effective in addressing community non-compliance, and most issues of non-compliance are addressed at this level.

In 2006, an AIR study found that the cooperative approach employed by FEMA, whereby FEMA works with the community to provide technical assistance and remedy the violation and/or correct program deficiencies, is cost-effective and successful in most communities (American Institutes for Research - Monday et al., 2006).

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| **NE** | While technical assistance is used by FEMA to assist communities in better complying with the minimum floodplain management criteria, there are, as discussed above, no effects on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH as a result of the implementation of the minimum floodplain management criteria. As such, there are likewise no effects to ESA-listed species, designated critical habitat, and EFH as a result of FEMA's provision of technical assistance to help communities better comply with those criteria. |

#### 6.1.1.6 Compliance Enforcement

If an NFIP community is in violation of the minimum floodplain management criteria, including the new ESA-related requirements, FEMA has some discretion over the type of enforcement action that it can take. Enforcement generally takes place when a pattern or practice of non-compliance by the community is identified. FEMA uses an enforcement hierarchy. FEMA starts with offering the community technical assistance to resolve the issues, and most non-compliance issues are resolved in this manner. However, if technical assistance is not effective, FEMA can take other actions, such as a CRS retrograde, in which a community's CRS status and the associated insurance premium discounts are removed, or issuing a warning letter. Typically, these consequences resolve the non-compliance issue for the community without further action by FEMA. If the violation still has not been resolved, FEMA will place the community on probation for one year. If the violation still has not been resolved after the community has been placed on probation for a year, FEMA will suspend the community from the NFIP.

In 2006, an AIR study estimated the nationwide rate of community compliance with NFIP requirements of 70 to 85 percent by making a series of assumptions about the representation of visited communities, the length of time that is reasonable for a community to take to remedy noncompliance, and the accuracy of community visit data entered into the Community Information System over a 5-year period. In this study, a community was considered to be compliant if it had no program deficiencies or violations or if it addressed them satisfactorily within two years. This study also found that the cooperative approach employed by FEMA, whereby FEMA works with the community to provide technical assistance and remedy the violation and/or correct program deficiencies, is cost-effective and successful in most communities (American Institutes for Research - Monday et al., 2006).

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| **NE** | While FEMA's compliance and enforcement measures are shown to improve community enforcement of the floodplain management criteria, there are, as discussed above, no effects on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH as a result of the implementation of the minimum floodplain management criteria. As such, there are likewise no effects to ESA-listed species, designated critical habitat, and EFH as a result of enforcement of those criteria. |

#### 6.1.1.7 Removal of Insurance Eligibility (pursuant to Section 1316)

There is an additional enforcement mechanism that is available to enforce the floodplain management regulations on specific non-compliant properties. Properties in an SFHA that are in violation of, or non-compliant with, State or local laws, regulations, or ordinances related to floodplain management can be denied flood insurance coverage, pursuant to Section 1316 of the NFIA, if a community requests that FEMA do so. FEMA does not have discretion over this action and cannot initiate a Section 1316 action without a request from the local community. This removal of insurance eligibility can act as a local enforcement tool within the community to encourage a property owner of a non-compliant property within the community to rectify the compliance issue(s). This enforcement tool is particularly effective in communities where the community regulations are not sufficient to enable the community to address the non-compliance issues through its existing laws.

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| **NE** | While this action may improve community enforcement of the floodplain management criteria, there are, as discussed above, no effects to ESA-listed species, designated critical habitat, and EFH as a result of the implementation of the minimum floodplain management criteria. As such, there are likewise no effects on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH as a result of enforcement of those criteria. |

#### 6.1.1.8 Monitor Community Compliance with NFIP via CAVs and CACs

As discussed above, FEMA conducts CACs and CAVs to monitor community floodplain management programs. A CAC is a telephone call or brief visit to an NFIP community to determine if any program-related problems exist and to offer assistance. A CAV is a scheduled visit to an NFIP community for the purpose of conducting a comprehensive assessment of the community's floodplain management program.

Once enrolled in the NFIP, communities generally receive CACs at regular intervals. During CAVs and CACs, FEMA assesses whether communities are adequately enforcing floodplain management criteria and provides technical assistance regarding any programmatic compliance issues.

FEMA's responsibility is to monitor and enforce a community's programmatic compliance with the ESA-related requirements as part of its general monitoring and enforcement of the minimum floodplain management criteria. FEMA will monitor and enforce the new ESA-related

requirements through the CAC and CAV process, just as it does with respect to all other floodplain management requirements.

At a CAC, FEMA will review the community's floodplain management ordinances, procedures, and enforcement provisions to determine whether the community has compliant ordinances and adequate enforcement provisions within those ordinances. FEMA may also offer technical assistance on any programmatic compliance issues.

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| **NE** | While FEMA's compliance monitoring actions are shown to improve community compliance with the floodplain management criteria, there are, as discussed above, no effects to ESA-listed species, designated critical habitat, and EFH as a result of the implementation of the minimum floodplain management criteria. As such, there are likewise no effects to on species listed as threatened or endangered or proposed for listing under the ESA, designated critical habitats, and EFH as a result of FEMA's monitoring of compliance with those criteria. |

### 6.1.2 Flood Hazard Mapping

The flood hazard mapping program element allows FEMA to identify flood hazards, assess flood risks, and collaborate with States and communities on flood hazard and risk data to guide them to mitigation measures. FEMA has some discretion over most of the flood hazard mapping activities. The actions and proposed modifications under the flood hazard mapping program element are discussed below.

#### 6.1.2.1 Decision to Publish FIRMs

FEMA has discretion regarding the level of study performed for the FIRM. The level of study performed is dependent on a number of factors, such as the level of community involvement, the level of flood risk, funding, and watershed characteristics. Community officials use flood hazard maps to establish zoning, land use, and building standards, including the development of higher regulatory standards than the minimum standards required as a condition of participation in the NFIP.

FEMA flood hazard maps provide a number of benefits that can positively affect ESA-listed species and designated critical habitat as well. By promoting broad based awareness of the risks associated with living in a floodplain, FEMA's flood hazard maps provide information that can help guide development away from flood hazard areas. FEMA also provides best available data, and upon request by the community, future conditions maps. This information may then be used by the communities and individuals to guide future decision-making regarding floodplain development and can discourage continued development in flood hazard areas.

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| **NE** | Although identification of flood hazard areas on a flood map could be used to guide floodplain development away from flood hazard areas, FEMA has no data or studies to support when and where such actions have taken place or will take place. As such, FEMA can claim no beneficial effects as a result of the publication of FIRMs. Accordingly, FEMA's decision whether to publish a FIRM, and the level of study performed for that FIRM, will have "No Effect" on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.2.2 Non-Regulatory Products and Features

As discussed above, FEMA provides other data layers and information to facilitate improved flood risk management and communication at the local level. Unlike regulatory flood hazard products (FIRM, FIS Report, FIRM Database), Flood Risk Products are not intended to be used as the basis for official actions required under the NFIP, such as determining the insurance rate for a property or enforcing minimum building standards for construction in a floodplain. These products

work alongside regulatory products to provide additional flood risk information and to support a community's overall floodplain management and hazard mitigation strategies and plans. There are also two key non-regulatory features that the NFIP offers, LiMWA and a future conditions layer on existing FIRMs. Although these do not exist as separate products because they are placed on the actual FIRM, they are non-regulatory features because they are not associated with any regulatory requirements under the NFIP (although communities may, and do, choose to regulate based on these non-regulatory features).

By promoting broad based awareness of the risks associated with living in a floodplain beyond those provided in the regulatory flood map, these non-regulatory products and features can provide even more information to inform land use planning and floodplain development decisions. Similar to FEMA's regulatory maps, non-regulatory products and features provide information that can help guide development away from flood hazard areas. Nevertheless, since use of these products in such a manner is entirely voluntary, and FEMA has no data to track the use of such non-regulatory products in this manner, FEMA cannot attribute any specific benefit to ESA-listed species or designated critical habitat as a result of this action.

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| **NE** | Although FEMA's non-regulatory products and features could be used to guide floodplain development away from flood hazard areas, FEMA has no data or studies to support when and where such actions have taken place or will take place. As such, FEMA can claim no beneficial effects as a result of the use of non-regulatory products. Accordingly, FEMA's non-regulatory products will have "No Effect" on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.2.3 Letter of Map Change (LOMC): LOMR and LOMR-F

As discussed above, there are a number of LOMCs that FEMA issues including the LOMA, the LOMR, and the LOMR-F. As a general rule, FEMA does not have discretion over whether to issue a LOMC. A property owner can submit a Letter of Map Change (LOMC) request if they believe that their property, which is shown in the SFHA on the FEMA map, is not actually located in an SFHA based upon submitted technical data. There are limitations imposed by the scale at which the maps are prepared, which may result in individual properties being inadvertently included in SFHAs. FEMA has developed a process, referred to as a LOMA, to correct these inadvertent inclusions. A LOMA is issued pursuant to an administrative procedure that involves the review of technical data submitted by the owner of property who believes the property has incorrectly been included in a designated SFHA. A LOMA establishes whether a specific property, or a specific structure on the property, is or is not located in an SFHA. LOMA applications typically involve the provision of additional information such as better and more precise elevation information. FEMA issues a letter stating that the property is in or out of the SFHA. These letters are not related to the floodplain development or for the physical structure, and there is no associated floodplain development involved. In fact, a LOMA cannot be issued if fill has been added to the lot or parcel. A property owner who submits a LOMA request generally only receives the map change if the structure(s) is on an area of natural high ground that is only in the SFHA due to the limitation of mapping scales. Accordingly, a LOMA will have no effect on ESA species, critical habitat, or EFH.

FEMA has also established administrative procedures for revising effective maps based on new or revised scientific or technical data that reflect other changes to the floodplain. This map action is referred to as Letter of Map Revision (LOMR). The LOMR process is an administrative process by which a community can submit technical data to revise the FIS and FIRM. The result is a letter from FEMA to the Chief Executive Officer of the community officially revising the current effective FIRM and FIS.

A LOMR-F is submitted for properties on which fill has been placed to raise the structure or lot to or above, the 1-percent-annual-chance flood elevation. A LOMR-F is an administrative process by which a property owner can submit technical data to establish that a specific property is or is not located in an SFHA. The result is a letter from FEMA to the Chief Executive Officer of the community officially designating if the structure or lot is located in an SFHA.

As discussed above, the Proposed Action does not cause floodplain development to occur. The available research and studies suggest that the NFIP is not a significant factor in the determination of whether or not to develop in the floodplain. However, to the extent that certain actions taken under the NFIP – specifically the issuance of certain letters of map change–are perceived to offer some encouragement to develop in the floodplain, FEMA seeks to undertake program changes to demonstrate that any floodplain development for which such a letter of map change is issued is ESA-compliant. FEMA is not responsible for private floodplain development, or for ensuring that such development is compliant with the ESA. However, FEMA does require written assurance of compliance with appropriate sections of 44 C.F.R. § 60.3 be provided by the participating community prior to issuing LOMR and LOMR-F determinations. Furthermore, FEMA will make program changes to require, per the floodplain management clarification regarding ESA compliance documentation, the community or the project proponent on the community's behalf produce documentation of compliance with the ESA prior to FEMA's processing of LOMR and LOMR-F requests. By documenting that the private floodplain development for which a LOMR or LOMR-F is sought is ESA-compliant, FEMA can demonstrate that it is only issuing LOMRs or LOMR-Fs for ESA-compliant floodplain development (and, thus, not encouraging floodplain development that adversely impacts ESA-listed species and designated critical habitat). Notably, this will include LOMCs issued to map levee accreditations, as well as AR Zone and A99 zone designations.

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| **NE** | Because issuance of these letters is a non-discretionary action that takes place after any floodplain development has occurred that may affect ESA-listed species, designated critical habitat, or EFH, these actions will have no effect on species listed as threatened or endangered or proposed for listing under the ESA, designated critical habitats, and EFH. Additionally, because the proposed change to require ESA compliance documentation as a condition of processing LOMRs and LOMR-Fs does not change the existing ESA-related compliance requirements associated with private floodplain development, but merely documents that such compliance is occurring, the proposed change will have "No Effect" on species listed as threatened or endangered or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.2.4 Conditional Letter of Map Change (CLOMC): CLOMR, CLOMR-F, and CLOMA

Unlike LOMCs, FEMA does have some discretion over Conditional Letter of Map Changes (CLOMCs) that are issued prior to any floodplain development has occurred, which generally focus on proposed projects in SFHAs, as opposed to pre-existing structures. FEMA may issue a Conditional Letter of Map Amendment (CLOMA), Conditional Letter of Map Revision based on Fill (CLOMR-F), or Conditional Letter of Map Revision (CLOMR), which are FEMA's comments on whether a project, if built as proposed, would justify a map revision or amendment. Because there are no practical consequences of FEMA's issuance of a CLOMC, the effects determination would typically be a "no effect." For areas outside the SFHA, where the minimum floodplain management criteria do not apply, this action has "no effect."

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| **NE** | Because there are no practical consequences of FEMA's issuance of a CLOMC on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH, the effects determination for this action is "no effect." |

#### 6.1.2.5 Community Outreach, Training, and General Technical Assistance

Community outreach, training FEMA personnel, and offering general technical assistance to communities on are discretionary actions.

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| **NE** | Community outreach, training FEMA personnel, and offering general technical assistance to SFHA are administrative actions that have no effect on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.2.6 Levee Accreditation Process and AR Zone–A99 Designations

The final three mapping designations under the flood hazard mapping program element are levee accreditation (Zone X [shaded]) and AR Zone and A99 determinations. These mapping designations are non-discretionary.

FEMA has criteria that must be followed by a community before a levee, levee system, or floodwall can be depicted on a FIRM as providing risk reduction to the 1-percent-annual-chance flood (also known as the Base Flood). However, FEMA does not certify, design, construct, permit, or approve levees, levee systems, or floodwalls.[21] FEMA only accredits levees, levee systems, and floodwalls that meet, and continue to meet, the minimum design, operation, and maintenance criteria outlined in 44 C.F.R. § 65.10; it is the communities' responsibility to maintain levees in compliance with those criteria.

Communities eligible for Zone A99 or Zone AR designations must show FEMA that, through the design, construction, or restoration of a flood protection structure, certain project milestones are met. These milestones may include proof the project has been authorized and paid for, the community has not been responsible for any delay in the project, and the project provided 1-percent-annual-chance flood risk reduction on an effective FIRM. Mapping a Zone A99 or Zone AR designation would create some changes in insurance premium rates, but the mandatory flood insurance purchase requirements and the minimum floodplain management criteria will still apply to those areas.

However, it is important to note that these actions (the determination that the levee system meets accreditation, Zone AR, or Zone A99 requirements) by themselves have no mapping consequences until a LOMC is issued reflecting these changes on a map. Likewise, the changes to insurance rates will not go into effect until a revised FIRM is issued and effective.

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| **NE** | Because accreditation and zone determinations are non-discretionary actions that take place after any floodplain development has occurred that may affect ESA-listed species, designated critical habitat, or EFH, and because these actions have no consequences (mapping or otherwise) until a LOMC is issued, accreditation and zone determinations will have no effect on species listed as threatened or endangered or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.2.7 Other "No Effect" Actions under Flood Hazard Mapping Element

FEMA has determined that several aspects under the NFIP's flood hazard mapping program are administrative and non-regulatory in nature and would thus have no effect on ESA species, designated critical habitat, or EFH. These "no effect" actions under flood hazard mapping primarily include desktop reviews and data organization, and they do not directly or indirectly influence floodplain construction or development practices. No effect actions under the flood hazard mapping program element include map sequencing; LOMA, Letter of Determination

[21] This was acknowledged by a Federal court in National Wildlife Federation v. FEMA, 2014 U.S. Dist, LEXIS 151386 (W.D. Wa. 2014).

Review (LODR), and CLOMA processes; data development and dissemination; and implementation of mapping standards, policies, and regulations. FEMA has discretion over how it disseminates data, but it does not have discretion over the performance of engineering analyses in creating FISs and SFHA maps.

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| **NE** | FEMA's administrative and non-regulatory actions do not directly or indirectly influence floodplain construction or development practices. Accordingly, FEMA's administrative and non-regulatory actions will have "No Effect" on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH. |

### 6.1.3 Flood Insurance

#### 6.1.3.1 Administering the Provision of Flood Insurance

FEMA does not have discretion over the provision of flood insurance. However, as FEMA consented to assess the effects of all aspects of the NFIP in this evaluation, FEMA has made effects determinations for the flood insurance elements of the program as well. FEMA has determined that all components under the NFIP's flood insurance program area are administrative in nature and would, therefore, have no effect on ESA species, designated critical habitats, or EFH. These no effect actions under the flood insurance program area are either administrative in nature, pertaining to the sale and marketing of flood insurance policies, or involve educating policyholders, WYO companies, agents, claims adjusters, and others about NFIP insurance-related program requirements and the terms and conditions of NFIP flood insurance policies. No effect actions under the flood insurance program element include: administering the WYO program, development and publication of insurance rates, insurance policy management, educating insurance agents and claims adjusters, marketing, adjusting loss claims, paying valid claims, and providing general technical assistance by insurance personnel.

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| **NE** | Administration of the provision of flood insurance under the NFIP includes administering the WYO program; development and publication of insurance rates; insurance policy management; educating insurance agents and claims adjusters; marketing; adjusting loss claims; paying valid claims; and providing general technical assistance by insurance personnel. These activities are administrative in nature and will have no effect on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.3.2 Flood Insurance Premium Rate Increases

FEMA's proposed modifications to the development and publication of insurance rates – to implement the premium rate increases imposed by Biggert Waters and HFIAA – will also have "no effect" on ESA species, critical habitats, or EFH. This change only applies to pre-FIRM policyholders. As discussed above, pre-FIRM policyholders are policyholders who built prior to the community's first FIRM. Since nearly all existing NFIP communities have FIRMs, the population of potential new pre-FIRM policyholders would be limited to policyholders in the existing NFIP communities without a FIRM or policyholders in communities that join the NFIP. The likelihood of a project proponent making a decision about whether or not to develop in the floodplain based on the premium increases that may be applicable should his or her community be mapped and/or join the NFIP is so remote that it is not even worthy of consideration in a discussion of the impacts of this proposed change. As such, FEMA's determination is that this proposed change would have "no effect" on ESA species, designated critical habitats, or EFH.

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| **NE** | Premium rate increases imposed by Biggert Waters and HFIAA will have no effect on species listed as threatened or endangered or proposed for listing under the ESA, designated critical habitats, and EFH. |

#### 6.1.3.3 Premium Installment Payments

Moreover, FEMA's proposed modifications to the sale of its insurance policies–to allow payment of policy premiums in installments–are unlikely to influence future developers and property buyers in SFHA areas. The program changes to allow for non-escrowed policyholders to pay for their flood insurance in installments is unlikely to encourage development because it is unlikely that an individual or family with the affordability issues that would necessitate utilization of an installment plan would have the disposable income to use for financing new floodplain development. Additionally, because FEMA intends to add a monthly service fee to installment plan policies, these policies are actually more expensive than annual policies, a factor that will serve to discourage their widespread use by anyone other than policyholders currently in a high flood risk area (but not subject to mandatory purchase since those premiums would be escrowed) for whom flood insurance is otherwise not affordable.

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| **NE** | Program changes that allow for non-escrowed policyholders to pay for their flood insurance in installments will have no effect on species listed as threatened, endangered, or proposed for listing under the ESA, designated critical habitats, and EFH. |

## 6.2 Interdependent and Interrelated Actions

The ESA implementing regulations define interdependent actions as those actions having no independent utility apart from the action under consideration (Proposed Action). Interrelated actions are part of a larger action and depend on the larger action for their justification (50 C.F.R. § 402.02). FEMA has determined that there are no interdependent actions.

The mandatory purchase requirement, which is discussed below, is an interrelated action because the NFIP was the reason for its establishment in 1973. When Tropical Storm Agnes resulted in significant damages in 1972 and only 95,000 NFIP policies were in force nationwide, it became evident that relatively few individuals in eligible communities who had sustained flood damage had purchased flood insurance. Congress found that the availability of subsidized flood insurance under the NFIA did not, by itself, provide sufficient incentive to attract extensive local community enrollment in the Program (S. Rep. No. 93-583, 93d Cong., 1st Sess. 4, reprinted in [1973] U.S. Code Cong. & Ad. News 3217, 3220 (Senate Report)). Accordingly, in order to increase the number of NFIP policies in force, Congress passed the Flood Disaster Protection Act of 1973 (1973 Act) (42 U.S.C. §§ 4001–4128). The Act contained a provision requiring the purchase of flood insurance as a condition of receiving federally-backed loans and Federal assistance in the SFHAs of participating communities. This is referred to as the mandatory flood insurance purchase requirement and resulted in an increase in flood insurance policies to approximately 1.2 million by the end of 1977, and 5.5 million as of May 31, 2012.

The mandatory purchase requirement is not a FEMA action. Although the mandatory purchase requirement is found in the NFIA, it is not implemented or enforced by the NFIP. While FEMA administers the NFIP, it has no responsibility or authority with respect to lender compliance with the mandatory flood Insurance purchase requirement. This responsibility falls on the Federal agency lender regulators and secondary-market purchasers.

The NFIA, as amended by the 1973 Act, states that regulated lending institutions cannot make, increase, extend, or renew any loan secured by improved real estate or a mobile home located, or to be located, in an SFHA in a participating NFIP community unless the secured building and any personal property securing the loan are covered by flood insurance for the term of the loan (Flood Disaster Protection Act of 1973, P. Law 93-234, as codified at 42 U.S.C. § 4012a(b)). Furthermore, Federal officers or agencies cannot approve any form of loan, grant, guaranty, insurance, payment, rebate, subsidy, disaster assistance loan or grant, for acquisition or

construction purposes within an SFHA in a participating community unless the building or mobile home and any personal property to which such financial assistance relates is covered during the life of the property (42 U.S.C. § 4012a(a)). For example, this would prohibit mortgage loans guaranteed by the Department of Veterans Affairs, insured by the Federal Housing Administration, or secured by the Rural Economic and Community Development Services. In the case of disaster assistance under the Robert T. Stafford Disaster Relief and Emergency Assistance Act of 1988, as amended, this prohibition only applies to assistance in connection with flooding[22] (42 U.S.C. §§ 5154, 5154a, 5171, and 5174).

Even with the establishment of the mandatory purchase requirement, the number of NFIP policies in force was still very low. Following the multi-billion dollar flood disaster in the Midwest in 1993, Congress enacted the National Flood Insurance Reform Act of 1994 (1994 Act). One of the purposes of the 1994 Act is to improve compliance with the mandatory purchase requirements of the NFIP by lenders, servicers, and secondary-market purchasers. Congress was concerned over the low level of insurance participation among eligible property owners and resulting increases in Federal disaster relief payments.

The law requires Federal agency lender regulators to develop regulations to direct their federally regulated lenders not to make, increase, extend, or renew any loan on applicable property unless flood insurance is purchased and maintained. The law also addresses the responsibility of regulated lending institutions and Government-Sponsored Enterprises (i.e., Fannie Mae and Freddie Mac) in providing a notice of and requiring flood insurance coverage for the term of the loan on buildings located in any SFHA in participating NFIP communities.

The 1994 Act significantly strengthened the 1973 Act by imposing important new obligations on both mortgage originators and servicers, including mandatory escrow requirements for flood insurance and mandatory provisions for "forced placement" of insurance. Specifically, the 1994 Act requires the forced placement of flood insurance if a lender or servicer determines that the building securing the loan is not adequately insured. Lenders may, on their own initiative, require the purchase of flood insurance even if a structure is located outside the SFHA. A decision to require coverage under such circumstance is not compelled by statute. Lenders have this prerogative to require flood insurance to protect their investments.

In a 2013 report, the Congressional Research Service found that nationally, recent reports suggest that only 18 percent of Americans in flood zone areas have flood insurance despite the mandatory purchase requirement (Congressional Research Service, 2013). That report stated:

> *Despite the existence of this mandatory flood insurance purchase requirement, take-up rates for flood insurance have historically been low and the Federal government's exposure to uninsured property losses from flooding remains substantial. Many homeowners do not completely recognize or internalize their flood risk and are overly optimistic about the magnitude of the flood risk to which they are exposed. Consequently, the NFIP has not achieved the level of individual participation originally envisioned by Congress.*

[22] Section 202(b) of the 1973 Act prohibited Federal officers or agencies from approving any form of loan, grant, guaranty, insurance, payment, rebate, subsidy, disaster assistance loan or grant, for acquisition or construction purposes within SFHAs in non-participating communities. However, the Housing and Community Development Act of 1977 amended section 202(b) of the 1973 Act to permit regulated lending institutions to make conventional loans in a SFHA of a non-participating community. It required them to notify the purchaser or lessee of improved property situated in a SFHA of a non-participating community and used to secure a loan being made, increased, extended, or renewed, whether Federal disaster assistance for flood damage will be available.

This suggests that despite the fact that the mandatory purchase requirement has incentivized communities to participate in the NFIP, it has not had similar success in incentivizing the behavior of individuals.

As stated above, the mandatory purchase requirement was included here as an interrelated action because the NFIP was the reason for its establishment in 1973. However, with the revision of the NFIA by the Biggert Waters Act to allow private flood insurance to satisfy the mandatory purchase requirement (42 U.S.C. § 4012a) and the continuing buildup of a private flood insurance market, the extent to which the mandatory purchase requirement will remain an interrelated action is unclear.

## 6.3 Cumulative Effects

According to the ESA, cumulative effects are effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Proposed Action included in this evaluation (50 C.F.R. § 402.02). This definition applies only to Section 7 analyses and should not be confused with the broader use of this term in the National Environmental Policy Act or other environmental laws. An assessment of cumulative effects occurs when the combined effects of an action are added to, or interact with, other effects in a particular place and within a particular timeframe.

For the purposes of this BE, reasonably foreseeable future actions are those State, Tribal, and local development projects in SFHAs nationwide likely to occur within the next 20 to 30 years. Because there are more than 22,000 NFIP-participating communities within the nationwide Action Area, these future effects would be difficult to reasonably quantify.

Cumulative effects occurring in floodplains could include the indirect effects of the Proposed Action, combined with private floodplain development activities across the nation initiated by State agencies or local jurisdictions, Tribal entities, or private landowners. Activities could range from residential and business development to expansion and construction of new infrastructure, such as buildings, roads, utilities, or water-related projects (e.g., irrigation withdrawals, bank protection, and general land clearing). These factors may inevitably affect surface waters and terrestrial and aquatic habitats. Across the nation, there are a number of State, local, and Tribal efforts to reduce and minimize ongoing cumulative effects to ESA species, designated critical habitats, and EFH to restore habitats, provide greater protection, and apply increasingly stringent water-related regulations.

While it is reasonably foreseeable that there will be private floodplain development in the Action Area within the next 20 to 30 years, the extent and the impacts of such development is not reasonably foreseeable. There are also a number of factors affecting ESA-listed species within the timeframe of the Proposed Action, which were discussed in detail in Section 3.5, that make it very difficult to determine what effects to ESA-listed species are properly attributable to private floodplain development, even if the extent of such development were somehow ascertainable. Moreover, the factors themselves are difficult to quantify.

There are a variety of unknown influencers related to protected species and habitats in the U.S. that are challenging to quantify. The U.S. population is continuing to grow, particularly near coastal floodplains, and is expected to continue growing. With an ever changing economy, development can increase or decrease in an area depending on the location. Between 1980 and 2000, the U.S. population increased by 24 percent. Over this same period, the amount of developed land in the U.S. increased by 34 percent. Forests, in particular, have been the largest source of land converted to developed uses in recent decades, with resulting impacts on forest cover and other ecological attributes (Alig, Kline, & Lichtenstein, 2003). With additional

development comes supporting infrastructure and related activities associated with an increase in population, which may in turn contribute to adverse cumulative effects to some species groups.

Hunting and overexploitation of species has occurred for centuries. Many large aquatic species, such as whales, were added as ESA species due to hunting and overexploitation. Large terrestrial animals are often killed merely because they make large targets or are trophies for large game hunters. Flightless birds and slow-moving animals face hunting pressure by introduced predators and humans. Animals of large size require considerable amounts of habitat and are, therefore, naturally rarer than species with smaller habitat requirements. When human populations rise and wilderness is replaced with towns and industry, large animals are the first to disappear, due either to loss of habitat and prey or because they are killed as potential threats. (Endangered Species Handbook, 1983)

Agricultural drainage and stormwater runoff introduce contaminants resulting in a wide range of effects that accumulate in the food chain. Water pollution can alter water quality in ways that are often detrimental to species impacting temperature, pH, sedimentation, visibility, hardness, dissolved oxygen, salinity, and nutrient availability. Half of the threatened and endangered species in the United States depend on water, living in the water for all or part of their life cycle or foraging on aquatic plants and/or animals. Domestic and industrial facilities, although regulated through a permit process, may exceed the permitted limits or otherwise discharge more than the receiving water system can accommodate. (U.S. Fish and Wildlife Service, 2015s)

Diseases affect species from the individual level to the ecosystem level, and can be the main driver of a species becoming threatened or endangered if pathogen transmission does not decrease as hosts become rare. Diseases can be detrimental to entire populations if the species has a high level of social interaction. Quantifying the impact of disease as an extinction factor has been difficult to quantify, because the effects of disease are difficult to isolate from other potential factors. (Frick, et al., 2015)

Disease also has a compounding effect on those endangered or threatened species with small populations and little genetic diversity. Lack of genetic diversity often results from inbreeding caused by geographic population division, founder effects, small population sizes, and lineage turnover. Species with fewer individuals or dispersed populations are more susceptible to succumbing to disease, as the species lacks the genetic diversity to effectively respond to the disease. (Agnarsson, Aviles, & Maddison, 2012)

Invasive species are species introduced to an ecosystem to which it is not native. Invasive species often cause harm to existing native species. Invasive species may be introduced intentionally, such as for pets or biocontrol, or unintentionally, such as in ballast water, hidden within vegetation, or other pathways. Invasive species can disturb natural communities and ecosystems. Impacts directly resulting from invasive species include reduction in stream flow; water degradation; displacement and/or major alteration of native plant communities including composition of the understory; competition for natural resources; disruption of the food chain; increase soil erosion; and increase wildfire potential. (U.S. Fish and Wildlife Service, 2012b)

Climate change has triggered changes in extreme weather, increasing the number and strength of events over the past 50 years. Events that potentially damage habitats include heat waves, drought, heavy precipitation (rain and snowfall), flooding events, hurricanes, and other storms such as tornadoes, hail, and damaging thunderstorms (U.S. Global Change Research Program, Undated). Increased extreme weather events not only have destructive effects to the areas in which they occur, but also to species. Migratory bird species located as far as 60 miles from a hurricane can experience a long-term population loss and during times of drought, population losses can be as high as 13 percent. (National Aeronautics and Space Administration, 2010)

Climate change can potentially cause abrupt changes to habitat and ecosystems, and may be a threat to many species. Notably, climate change is affecting the migration of songbirds; birds' arrival dates are occurring before the availability of the necessary food supply. Climate change has exacerbated wildfires, insect outbreaks, pathogens, coral bleaching, disease outbreaks, and tree mortality. Higher water temperatures resulting from climate change impact cold and cool water fish, and rising sea levels affect fish and wildlife habitats. (U.S. Fish and Wildlife Service, 2012a)

It is generally accepted that climate change will result in a sea-level rise of 0.5 m to 2.0 m by 2100 thereby causing erosion and increased flooding, as well as submerging low-lying coastal areas. Habitat degradation and elimination will directly result from unmitigated climate change; however, there is much uncertainty concerning the magnitude and sources of impacts of sea-level-rise. Contradicting views on the effects of climate change are found in literature, and both are supported by empirical evidence. One school of thought believes the effects of sea level rise will be mitigated and habitat protection measures put in place, and those protection measures will be successful. In this body of research, actual impacts are smaller than potential impacts, although significant costs are associated with habitat protection measures. Conversely, others believe that climate change adaptation, mitigation, and habitat protection measures will either fail or will not be attempted, perhaps due to infeasibility. Potential impacts are accepted as actual impacts, translating to numerous, high impact disasters, with a high probability of retreat and abandonment of affected areas. More research on the effects of climate change adaptation, protection, and mitigation in coastal areas is necessary. (Nicholls, R. et al., 2010)

# 7 CONCLUSIONS

Based on a review of the current status of ESA species and critical habitat, the environmental baseline for the Action Area, the effects of the Proposed Action, and cumulative effects, FEMA has determined that the Proposed Action will have no effect on the continued existence of species listed as threatened or endangered under the ESA, designated critical habitat, and EFH.

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