**ATTACHMENT 1-11: Biological Information on Listed Species of Fish and Model Parameterization for Pesticide Effects Determinations**

1. **Introduction**

The purpose of this document is to summarize available information for currently listed, proposed and candidate fish species (from the National Marine Fisheries Service and US Fish and Wildlife Service). The focus of this effort is to capture information that may be used in ecological risk assessments of pesticides to make species-specific effects determinations to be included in biological evaluations submitted for consultations under section 7 of the Endangered Species Act. This report focuses on defining parameters, such as habitat, which may be used to estimate pesticide exposures to listed fish. This report also focuses on defining species characteristics, such as prey items, that may be used to assess potential indirect effects to the species.

A formal quality assurance and quality control plan was implemented in the collection of species-specific data. The instructions for extracting information for fish are included in **SUPPLEMENTAL INFORMATION 1**. A template for the worksheet used to record relevant biological information for each species is provided in **SUPPLEMENTAL INFORMATION 2**. **SUPPLEMENTAL INFORMATION 3** contains the completed worksheets containing biological information on each listed fish species, Evolutionarily **Significant Unit (ESU)**, or **Distinct Population Segment** (DPS).

At this time, there are a total of 163 species, subspecies or populations (*e.g*., ESUs/DPSs) of fish that are listed as endangered or threatened under the Endangered Species Act (ESA) and occur in the United States, its territories and its waters. In addition, there are 37 species whose status is that of candidate, experimental, or proposed (**Table A 1-11.1**). Of the endangered or threatened species, 109 have designated critical habitats. Fish species are from 19 different orders and are found in freshwater and marine/estuarine habitats (or both) (**Table A 1-11.2**). These species will be considered in the national level risk assessments for carbaryl, chlorpyrifos, diazinon, malathion and methomyl. A list of species considered in this assessment is in **Table A 1-11.3**. This assessment does not consider species listed as “foreign” because they occur outside of the action area for pesticide registrations in the US.

**Table A 1-11.1. Number of listed fish by status.**

|  |  |
| --- | --- |
| **Status** | **Number of listings** |
| Endangered | 90 |
| Threatened | 73 |
| Candidate | 18 |
| Experimental | 17 |
| Proposed | 2 |
| Total | 200 |

**Table A 1-11.2. Number of listed fish by Order differentiated by habitat.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Order** | **Freshwater** | **Marine/Estuarine** | **Both** | **Total** |
| Acipenseriformes | 3 |  | 8 | 11 |
| Atheriniformes | 1 |  |  | 1 |
| Carcharhiniformes |  | 5 |  | 5 |
| Clupeiformes | 1 |  |  | 1 |
| Cypriniformes | 62 |  | 1 | 63 |
| Cyprinodontiformes | 16 |  |  | 16 |
| Gadiformes |  | 1 |  | 1 |
| Gasterosteiformes | 1 |  |  | 1 |
| Lamniformes |  | 1 |  | 1 |
| Myliobatiformes |  | 2 |  | 2 |
| Osmeriformes |  |  | 3 | 3 |
| Perciformes | 32 | 3 | 1 | 36 |
| Percopsiformes | 2 |  |  | 2 |
| Pristiformes |  |  | 1 | 1 |
| Salmoniformes | 6 |  | 31 | 37 |
| Scorpaeniformes | 2 | 3 |  | 5 |
| Siluriformes | 12 |  |  | 12 |
| Syngnathiformes |  | 1 |  | 1 |
| Torpediniformes |  | 1 |  | 1 |
| **Total** | **138** | **17** | **45** | **200** |

**Table A 1-11.3. Listed species of fish included in pesticide effects determinations, along with their listing status, whether critical habitat has been designated, and habitat type.**

| **Scientific Name** | **Common Name**  **(Population/DPS/ESU)** | **Population/DPS/ESU** | **Order** | **Listing Status** | **Critical Habitat?** | **Marine/Estuarine or Freshwater** | **USFWS Species ID (ENTITY\_ID)** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| *Acipenser brevirostrum* | ShortNose sturgeon |  | Acipenseriformes | Endangered | NO | Both | 4330 |
| *Acipenser medirostris* | Green Sturgeon | Southern DPS | Acipenseriformes | Threatened | YES | Both | 4093 |
| *Acipenser oxyrinchus (=oxyrhynchus) desotoi* | Gulf Sturgeon |  | Acipenseriformes | Threatened | YES | Both | 286 |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | Gulf of Maine DPS | Acipenseriformes | Threatened | NO | Both | 10297 |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | New York Bight DPS | Acipenseriformes | Endangered | NO | Both | 10298 |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | Chesapeake Bay DPS | Acipenseriformes | Endangered | NO | Both | 10299 |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | Carolina DPS | Acipenseriformes | Endangered | NO | Both | 10300 |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | South Atlantic DPS | Acipenseriformes | Endangered | NO | Both | 10301 |
| *Acipenser transmontanus* | White sturgeon |  | Acipenseriformes | Endangered | YES | Freshwater | 314 |
| *Alosa alabamae* | Alabama shad |  | Clupeiformes | Candidate | NO | Freshwater | NMFS166 |
| *Amblyopsis rosae* | Ozark cavefish |  | Percopsiformes | Threatened | NO | Freshwater | 260 |
| *Brosme brosme* | Cusk |  | Gadiformes | Candidate | NO | Marine | NMFS137 |
| *Carcharhinus longimanus* | Oceanic whitetip shark |  | Carcharhiniformes | Candidate | No | Marine | NMFS175 |
| *Catostomus discobolus yarrowi* | Zuni bluehead Sucker |  | Cypriniformes | Endangered | YES | Freshwater | 3280 |
| *Catostomus santaanae* | Santa Ana sucker | 3 CA river basins | Cypriniformes | Threatened | YES | Freshwater | 312 |
| *Catostomus warnerensis* | Warner sucker |  | Cypriniformes | Threatened | YES | Freshwater | 292 |
| *Chasmistes brevirostris* | ShortNose Sucker |  | Cypriniformes | Endangered | YES | Freshwater | 291 |
| *Chasmistes cujus* | Cui-ui |  | Cypriniformes | Endangered | NO | Freshwater | 210 |
| *Chasmistes liorus* | June sucker |  | Cypriniformes | Endangered | YES | Freshwater | 287 |
| *Chrosomus saylori* | Laurel dace |  | Cypriniformes | Endangered | YES | Freshwater | 9220 |
| *Cottus paulus (=pygmaeus)* | Pygmy Sculpin |  | Scorpaeniformes | Threatened | NO | Freshwater | 241 |
| *Cottus specus* | Grotto Sculpin |  | Scorpaeniformes | Endangered | NO | Freshwater | 4248 |
| *Crenichthys baileyi baileyi* | White River springfish |  | Cyprinodontiformes | Endangered | YES | Freshwater | 285 |
| *Crenichthys baileyi grandis* | Hiko White River springfish |  | Cyprinodontiformes | Endangered | YES | Freshwater | 283 |
| *Crenichthys nevadae* | Railroad Valley springfish |  | Cyprinodontiformes | Threatened | YES | Freshwater | 284 |
| *Crystallaria cincotta* | Diamond Darter |  | Perciformes | Endangered | YES | Freshwater | 6557 |
| *Cyprinella caerulea* | Blue shiner |  | Cypriniformes | Threatened | NO | Freshwater | 300 |
| *Cyprinella formosa* | Beautiful shiner |  | Cypriniformes | Threatened | YES | Freshwater | 276 |
| *Cyprinodon bovinus* | Leon Springs pupfish |  | Cyprinodontiformes | Endangered | YES | Freshwater | 251 |
| *Cyprinodon diabolis* | Devils Hole pupfish |  | Cyprinodontiformes | Endangered | NO | Freshwater | 217 |
| *Cyprinodon elegans* | Comanche Springs pupfish |  | Cyprinodontiformes | Endangered | NO | Freshwater | 216 |
| *Cyprinodon macularius* | Desert pupfish |  | Cyprinodontiformes | Endangered | YES | Freshwater | 275 |
| *Cyprinodon nevadensis mionectes* | Ash Meadows Amargosa pupfish |  | Cyprinodontiformes | Endangered | YES | Freshwater | 274 |
| *Cyprinodon nevadensis pectoralis* | Warm Springs pupfish |  | Cyprinodontiformes | Endangered | NO | Freshwater | 231 |
| *Cyprinodon radiosus* | Owens pupfish |  | Cyprinodontiformes | Endangered | NO | Freshwater | 218 |
| *Deltistes luxatus* | Lost River sucker |  | Cypriniformes | Endangered | YES | Freshwater | 288 |
| *Dionda diaboli* | Devils River minNow |  | Cypriniformes | Threatened | YES | Freshwater | 272 |
| *Elassoma alabamae* | Spring pygmy sunfish |  | Perciformes | Threatened | NO | Freshwater | 7332 |
| *Empetrichthys latos* | Pahrump poolfish |  | Cyprinodontiformes | Endangered | NO | Freshwater | 8389 |
| *Epinephelus striatus* | Nassau Grouper |  | Perciformes | Proposed Threatened | NO | Marine | NMFS125 |
| *Eremichthys acros* | Desert dace |  | Cypriniformes | Threatened | YES | Freshwater | 266 |
| *Erimonax monachus* | Spotfin Chub | except for experimental | Cypriniformes | Threatened | YES | Freshwater | 237 |
| *Erimonax monachus* | Spotfin Chub | Tellico River, TN | Cypriniformes | Experimental Population Non-Essential | YES | Freshwater | 1934 |
| *Erimonax monachus* | Spotfin Chub | Shoal Creek | Cypriniformes | Experimental Population Non-Essential | YES | Freshwater | 9061 |
| *Erimonax monachus* | Spotfin Chub | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(m)(1)(iii)) | Cypriniformes | Experimental Population Non-Essential | YES | Freshwater | 9505 |
| *Erimystax cahni* | Slender chub | except for experimental | Cypriniformes | Threatened | YES | Freshwater | 246 |
| *Erimystax cahni* | Slender chub | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(s)(1)(i)) | Cypriniformes | Experimental Population Non-Essential | YES | Freshwater | 9504 |
| *Etheostoma boschungi* | Slackwater darter |  | Perciformes | Threatened | YES | Freshwater | 239 |
| *Etheostoma chermocki* | Vermilion darter |  | Perciformes | Endangered | YES | Freshwater | 316 |
| *Etheostoma chienense* | Relict darter |  | Perciformes | Endangered | NO | Freshwater | 313 |
| *Etheostoma cragini* | Arkansas darter |  | Perciformes | Candidate | NO | Freshwater | 3879 |
| *Etheostoma etowahae* | Etowah darter |  | Perciformes | Endangered | NO | Freshwater | 315 |
| *Etheostoma fonticola* | Fountain darter |  | Perciformes | Endangered | YES | Freshwater | 228 |
| *Etheostoma moorei* | Yellowcheek Darter |  | Perciformes | Endangered | YES | Freshwater | 6662 |
| *Etheostoma nianguae* | Niangua darter |  | Perciformes | Threatened | YES | Freshwater | 257 |
| *Etheostoma nuchale* | Watercress darter |  | Perciformes | Endangered | NO | Freshwater | 229 |
| *Etheostoma okaloosae* | Okaloosa darter |  | Perciformes | Threatened | NO | Freshwater | 224 |
| *Etheostoma percnurum* | Duskytail darter | except for experimental | Perciformes | Endangered | NO | Freshwater | 308 |
| *Etheostoma percnurum* | Duskytail darter | Tellico River, TN | Perciformes | Experimental Population Non-Essential | NO | Freshwater | 6503 |
| *Etheostoma percnurum* | Duskytail darter | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(q)(1)(ii)) | Perciformes | Experimental Population Non-Essential | NO | Freshwater | 9502 |
| *Etheostoma phytophilum* | Rush Darter |  | Perciformes | Endangered | YES | Freshwater | 3525 |
| *Etheostoma rubrum* | Bayou darter |  | Perciformes | Threatened | NO | Freshwater | 244 |
| *Etheostoma scotti* | Cherokee darter |  | Perciformes | Threatened | NO | Freshwater | 269 |
| *Etheostoma sellare* | Maryland darter |  | Perciformes | Endangered | YES | Freshwater | 212 |
| *Etheostoma sp.* | Bluemask (=jewel) Darter |  | Perciformes | Endangered | NO | Freshwater | 307 |
| *Etheostoma spilotum* | Kentucky arrow darter |  | Perciformes | Candidate | NO | Freshwater | 10060 |
| *Etheostoma susanae* | Cumberland darter |  | Perciformes | Endangered | YES | Freshwater | 5719 |
| *Etheostoma wapiti* | Boulder darter | except for experimental | Perciformes | Endangered | NO | Freshwater | 297 |
| *Etheostoma wapiti* | Boulder darter | Shoal Creek | Perciformes | Experimental Population Non-Essential | NO | Freshwater | 8921 |
| *Eucyclogobius newberryi* | Tidewater goby |  | Perciformes | Endangered | YES | Both | 306 |
| *Gambusia gaigei* | Big Bend gambusia |  | Cyprinodontiformes | Endangered | NO | Freshwater | 213 |
| *Gambusia georgei* | San Marcos gambusia |  | Cyprinodontiformes | Endangered | YES | Freshwater | 250 |
| *Gambusia heterochir* | Clear Creek gambusia |  | Cyprinodontiformes | Endangered | NO | Freshwater | 214 |
| *Gambusia Nobilis* | Pecos gambusia |  | Cyprinodontiformes | Endangered | NO | Freshwater | 230 |
| *Gasterosteus aculeatus williamsoni* | Unarmored threespine stickleback |  | Gasterosteiformes | Endangered | NO | Freshwater | 232 |
| *Gila bicolor ssp.* | Hutton tui chub |  | Cypriniformes | Threatened | NO | Freshwater | 261 |
| *Gila bicolor ssp. mohavensis* | Mohave tui chub |  | Cypriniformes | Endangered | NO | Freshwater | 225 |
| *Gila bicolor ssp. snyderi* | Owens tui chub |  | Cypriniformes | Endangered | YES | Freshwater | 262 |
| *Gila boraxobius* | Borax Lake chub |  | Cypriniformes | Endangered | YES | Freshwater | 253 |
| *Gila cypha* | Humpback chub |  | Cypriniformes | Endangered | YES | Freshwater | 209 |
| *Gila ditaenia* | SoNora chub |  | Cypriniformes | Threatened | YES | Freshwater | 255 |
| *Gila elegans* | Bonytail chub |  | Cypriniformes | Endangered | YES | Freshwater | 249 |
| *Gila intermedia* | Gila chub |  | Cypriniformes | Endangered | YES | Freshwater | 6297 |
| *Gila nigra* | Headwater chub |  | Cypriniformes | Candidate | NO | Freshwater | 8561 |
| *Gila nigrescens* | Chihuahua chub |  | Cypriniformes | Threatened | NO | Freshwater | 254 |
| *Gila purpurea* | Yaqui chub |  | Cypriniformes | Endangered | YES | Freshwater | 263 |
| *Gila robusta* | Roundtail chub | Lower Colorado River Basin DPS | Cypriniformes | Candidate | NO | Freshwater | 3497 |
| *Gila robusta jordani* | Pahranagat roundtail chub |  | Cypriniformes | Endangered | NO | Freshwater | 226 |
| *Gila seminuda (=robusta)* | Virgin River Chub |  | Cypriniformes | Endangered | YES | Freshwater | 256 |
| *Hippocampus zosterae* | Dwarf seahorse |  | Syngnathiformes | Candidate | NO | Marine | NMFS139 |
| *Hybognathus amarus* | Rio Grande Silvery MinNow | except for experimental | Cypriniformes | Endangered | YES | Freshwater | 309 |
| *Hybognathus amarus* | Rio Grande Silvery MinNow | Rio Grande, from Little Box Canyon to Amistad Dam | Cypriniformes | Experimental Population Non-Essential | NO | Freshwater | 10052 |
| *Hypomesus transpacificus* | Delta smelt |  | Osmeriformes | Threatened | YES | Both | 305 |
| *Ictalurus pricei* | Yaqui catfish |  | Siluriformes | Threatened | YES | Freshwater | 259 |
| *Lamna nasus* | Porbeagle shark |  | Lamniformes | Candidate | NO | Marine | NMFS176 |
| *Lepidomeda albivallis* | White River spinedace |  | Cypriniformes | Endangered | YES | Freshwater | 282 |
| *Lepidomeda mollispinis pratensis* | Big Spring spinedace |  | Cypriniformes | Threatened | YES | Freshwater | 280 |
| *Lepidomeda vittata* | Little Colorado spinedace |  | Cypriniformes | Threatened | YES | Freshwater | 281 |
| *Manta birostris* | Giant manta ray |  | Myliobatiformes | Candidate | NO | Marine | NMFS174 |
| *Manta alfredi* | Reef manta ray |  | Myliobatiformes | Candidate | NO | Marine | NMFS173 |
| *Meda fulgida* | Spikedace |  | Cypriniformes | Endangered | YES | Freshwater | 296 |
| *Menidia extensa* | Waccamaw silverside |  | Atheriniformes | Threatened | YES | Freshwater | 243 |
| *Moapa coriacea* | Moapa dace |  | Cypriniformes | Endangered | NO | Freshwater | 211 |
| *Moxostoma sp.* | Sicklefin redhorse |  | Cypriniformes | Candidate | NO | Freshwater | 8442 |
| *Mycteroperca fusca* | Island grouper |  | Perciformes | Proposed Threatened | NO | Marine | NMFS179 |
| *Mycteroperca jordani* | Gulf grouper |  | Perciformes | Candidate | NO | Marine | NMFS134 |
| *Narcine bancroftii* | Caribbean electric ray |  | Torpediniformes | Candidate | NO | Marine | NMFS138 |
| *Notropis albizonatus* | Palezone shiner |  | Cypriniformes | Endangered | NO | Freshwater | 278 |
| *Notropis buccula* | Smalleye Shiner |  | Cypriniformes | Endangered | YES | Freshwater | 7670 |
| *Notropis cahabae* | Cahaba shiner |  | Cypriniformes | Endangered | NO | Freshwater | 277 |
| *Notropis girardi* | Arkansas River shiner | Arkansas R. Basin | Cypriniformes | Threatened | YES | Freshwater | 299 |
| *Notropis mekistocholas* | Cape Fear shiner |  | Cypriniformes | Endangered | YES | Freshwater | 242 |
| *Notropis oxyrhynchus* | SharpNose Shiner |  | Cypriniformes | Endangered | YES | Freshwater | 3596 |
| *Notropis simus pecosensis* | Pecos bluntNose shiner |  | Cypriniformes | Threatened | YES | Freshwater | 279 |
| *Notropis topeka (=tristis)* | Topeka shiner | except for experimental | Cypriniformes | Endangered | YES | Freshwater | 311 |
| *Notropis topeka (=tristis)* | Topeka shiner | Northern Missouri Experimental Population | Cypriniformes | Experimental Population Non-Essential | NO | Freshwater | 10910 |
| *Noturus baileyi* | Smoky madtom | except for experimental | Siluriformes | Endangered | YES | Freshwater | 258 |
| *Noturus baileyi* | Smoky madtom | Tellico River, TN | Siluriformes | Experimental Population Non-Essential | YES | Freshwater | 5981 |
| *Noturus crypticus* | Chucky Madtom |  | Siluriformes | Endangered | YES | Freshwater | 7150 |
| *Noturus flavipinnis* | Yellowfin madtom | except for experimental | Siluriformes | Threatened | YES | Freshwater | 247 |
| *Noturus flavipinnis* | Yellowfin madtom | Tellico River, TN | Siluriformes | Experimental Population Non-Essential | NO | Freshwater | 2956 |
| *Noturus flavipinnis* | Yellowfin madtom | Holston River, VA, TN | Siluriformes | Experimental Population Non-Essential | NO | Freshwater | 4496 |
| *Noturus flavipinnis* | Yellowfin madtom | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(e)(1)(iii)) | Siluriformes | Experimental Population Non-Essential | NO | Freshwater | 9506 |
| *Noturus placidus* | Neosho madtom |  | Siluriformes | Threatened | NO | Freshwater | 270 |
| *Noturus stanauli* | Pygmy madtom | except for experimental | Siluriformes | Endangered | NO | Freshwater | 271 |
| *Noturus stanauli* | Pygmy madtom | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(t)(1)(i)) | Siluriformes | Experimental Population Non-Essential | NO | Freshwater | 9503 |
| *Noturus trautmani* | Scioto madtom |  | Siluriformes | Endangered | NO | Freshwater | 245 |
| *Oncorhynchus (=Salmo) kisutch* | Coho salmon | Oregon Coast ESU | Salmoniformes | Threatened | YES | Both | 5265 |
| *Oncorhynchus (=Salmo) kisutch* | Coho salmon | Southern Oregon - Northern California Coast ESU | Salmoniformes | Threatened | YES | Both | 6578 |
| *Oncorhynchus (=Salmo) kisutch* | Coho salmon | Central California Coast ESU | Salmoniformes | Endangered | YES | Both | 6966 |
| *Oncorhynchus (=Salmo) kisutch* | Coho salmon | Lower Columbia River ESU | Salmoniformes | Threatened | YES | Both | 9021 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Northern California DPS | Salmoniformes | Threatened | YES | Both | 2448 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Upper Columbia River DPS | Salmoniformes | Threatened | YES | Both | 2528 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | South-Central California Coast DPS | Salmoniformes | Threatened | YES | Both | 2842 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Central California Coast DPS | Salmoniformes | Threatened | YES | Both | 3654 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Upper Willamette River DPS | Salmoniformes | Threatened | YES | Both | 4112 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | California Central Valley DPS | Salmoniformes | Threatened | YES | Both | 4274 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Southern California DPS | Salmoniformes | Endangered | YES | Both | 5658 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Middle Columbia River DPS | Salmoniformes | Threatened | YES | Both | 5815 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Lower Columbia River DPS | Salmoniformes | Threatened | YES | Both | 6220 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Snake River Basin DPS | Salmoniformes | Threatened | YES | Both | 7989 |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Puget Sound DPS | Salmoniformes | Threatened | Proposed | Both | NMFS88 |
| *Oncorhynchus (=Salmo) nerka* | Sockeye salmon | Ozette Lake ESU | Salmoniformes | Threatened | YES | Both | 6843 |
| *Oncorhynchus (=Salmo) nerka* | Sockeye salmon | Snake River ESU | Salmoniformes | Endangered | YES | Both | 8278 |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Central Valley spring-run ESU | Salmoniformes | Threatened | YES | Both | 2514 |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Snake River spring/summer-run ESU | Salmoniformes | Threatened | YES | Both | 3398 |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Snake River fall-run ESU | Salmoniformes | Threatened | YES | Both | 4300 |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Puget Sound ESU | Salmoniformes | Threatened | YES | Both | 4799 |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | California Coastal ESU | Salmoniformes | Threatened | YES | Both | 4992 |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Upper Columbia spring-run ESU | Salmoniformes | Endangered | YES | Both | 7590 |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Lower Columbia River ESU | Salmoniformes | Threatened | YES | Both | 7834 |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Sacramento River winter-run ESU | Salmoniformes | Endangered | YES | Both | 7855 |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Upper Willamette River ESU | Salmoniformes | Threatened | YES | Both | 8241 |
| *Oncorhynchus aguabonita whitei* | Little Kern golden trout |  | Salmoniformes | Threatened | YES | Freshwater | 248 |
| *Oncorhynchus apache* | Apache trout |  | Salmoniformes | Threatened | NO | Freshwater | 220 |
| *Oncorhynchus clarki stomias* | Greenback Cutthroat trout |  | Salmoniformes | Threatened | NO | Freshwater | 222 |
| *Oncorhynchus clarkii henshawi* | Lahontan cutthroat trout |  | Salmoniformes | Threatened | NO | Freshwater | 233 |
| *Oncorhynchus clarkii seleniris* | Paiute cutthroat trout |  | Salmoniformes | Threatened | NO | Freshwater | 223 |
| *Oncorhynchus gilae* | Gila trout |  | Salmoniformes | Threatened | NO | Freshwater | 221 |
| *Oncorhynchus keta* | Chum salmon | Hood Canal summer-run ESU | Salmoniformes | Threatened | YES | Both | 1509 |
| *Oncorhynchus keta* | Chum salmon | Columbia River ESU | Salmoniformes | Threatened | YES | Both | 5180 |
| *Percina antesella* | Amber darter |  | Perciformes | Endangered | YES | Freshwater | 293 |
| *Percina aurolineata* | Goldline darter |  | Perciformes | Threatened | NO | Freshwater | 298 |
| *Percina aurora* | Pearl darter |  | Perciformes | Candidate | NO | Freshwater | 4431 |
| *Percina jenkinsi* | Conasauga logperch |  | Perciformes | Endangered | YES | Freshwater | 294 |
| *Percina pantherina* | Leopard darter |  | Perciformes | Threatened | YES | Freshwater | 238 |
| *Percina rex* | Roanoke logperch |  | Perciformes | Endangered | NO | Freshwater | 240 |
| *Percina tanasi* | Snail darter |  | Perciformes | Threatened | YES | Freshwater | 235 |
| *Phoxinus cumberlandensis* | Blackside dace |  | Cypriniformes | Threatened | NO | Freshwater | 295 |
| *Plagopterus argentissimus* | Woundfin | except for experimental | Cypriniformes | Endangered | YES | Freshwater | 234 |
| *Plagopterus argentissimus* | Woundfin | Gila R. drainage, AZ, NM | Cypriniformes | Experimental Population Non-Essential | NO | Freshwater | 2599 |
| *Poeciliopsis occidentalis* | Gila topminnow (incl. Yaqui) | U.S.A. only | Cyprinodontiformes | Endangered | NO | Freshwater | 219 |
| *Pristis pectinata* | Smalltooth sawfish | United States DPS | Pristiformes | Endangered | YES | Both | 4881 |
| *Ptychocheilus lucius* | Colorado pikeminnow (=squawfish) | except for experimental | Cypriniformes | Endangered | YES | Freshwater | 215 |
| *Ptychocheilus lucius* | Colorado pikeminnow (=squawfish) | Salt and Verde R. drainages, AZ | Cypriniformes | Experimental Population Non-Essential | NO | Freshwater | 2142 |
| *Rhinichthys osculus lethoporus* | Independence Valley speckled dace |  | Cypriniformes | Endangered | NO | Freshwater | 268 |
| *Rhinichthys osculus nevadensis* | Ash Meadows speckled dace |  | Cypriniformes | Endangered | YES | Freshwater | 264 |
| *Rhinichthys osculus oligoporus* | Clover Valley speckled dace |  | Cypriniformes | Endangered | NO | Freshwater | 265 |
| *Rhinichthys osculus ssp.* | Foskett speckled dace |  | Cypriniformes | Threatened | NO | Freshwater | 267 |
| *Rhinichthys osculus thermalis* | Kendall Warm Springs dace |  | Cypriniformes | Endangered | NO | Freshwater | 227 |
| *Salmo salar* | Atlantic salmon | Gulf of Maine DPS | Salmoniformes | Endangered | YES | Both | 10077 |
| *Salvelinus confluentus* | Bull Trout | U.S.A., conterminous, lower 48 states | Salmoniformes | Threatened | YES | Both | 301 |
| *Salvelinus confluentus* | Bull Trout | Clackamas River subbasin experimental population | Salmoniformes | Experimental Population Non-Essential | NO | Both | 10037 |
| *Scaphirhynchus albus* | Pallid sturgeon |  | Acipenseriformes | Endangered | NO | Freshwater | 303 |
| *Scaphirhynchus suttkusi* | Alabama sturgeon |  | Acipenseriformes | Endangered | YES | Freshwater | 252 |
| *Sebastes paucispinis* | Bocaccio | Puget Sound - Georgia Basin DPS | Scorpaeniformes | Endangered | YES | Marine | 10142 |
| *Sebastes pinniger* | Canary rockfish | Puget Sound - Georgia Basin DPS | Scorpaeniformes | Threatened | YES | Marine | 10151 |
| *Sebastes ruberrimus* | Yelloweye rockfish | Puget Sound - Georgia Basin DPS | Scorpaeniformes | Threatened | YES | Marine | 10153 |
| *Speoplatyrhinus poulsoni* | Alabama cavefish |  | Percopsiformes | Endangered | YES | Freshwater | 236 |
| *Sphyrna lewini* | Scalloped Hammerhead Shark | Eastern Pacific DPS | Carcharhiniformes | Endangered | NO | Marine | 10733 |
| *Sphyrna lewini* | Scalloped Hammerhead Shark | Central and Southwest Atlantic DPS | Carcharhiniformes | Threatened | NO | Marine | 10734 |
| *Sphyrna lewini* | Scalloped Hammerhead Shark | Indo-West Pacific DPS | Carcharhiniformes | Threatened | NO | Marine | 10736 |
| *Sphyrna zygaena* | Smooth hammerhead shark |  | Carcharhiniformes | Candidate | NO | Marine | NMFS177 |
| *Spirinchus thaleichthys* | Longfin smelt San Francisco Bay delta population | San Francisco Bay delta DPS | Osmeriformes | Candidate | NO | Both | 6416 |
| *Thaleichthys pacificus* | Eulachon | Southern DPS | Osmeriformes | Threatened | YES | Both | 10150 |
| *Tiaroga cobitis* | Loach minNow |  | Cypriniformes | Endangered | YES | Freshwater | 273 |
| *Xyrauchen texanus* | Razorback sucker |  | Cypriniformes | Endangered | YES | Both | 290 |

1. **Diets**

Listed species of fish consume primarily invertebrates (**Table A 1-11.4**). **Table A 1-11.5** defines the prey consumed by each listed fish species. The categories used to group fish prey items are chosen based on those used to assess indirect effects of exposure to pesticides based on reductions in prey. Some fish may consume detritus, which can be a combination of several prey items including plants, invertebrates and fish as well as other organic matter. Detritus is not a primary prey item for listed fish species and is not captured as a dietary item for modeling indirect effects due to the complexity and uncertainty of its composition. Additional details and source information are provided in **SUPPLEMENTAL INFORMATION 3**.

**Table A 1-11.4. Number of listed fish with each dietary item category.**

|  |  |  |
| --- | --- | --- |
| **Dietary item** | | **Number of species** |
| Plant matter | Algae | 45 |
| Aquatic plants | 24 |
| Invertebrates | Freshwater | 177 |
| Seawater | 60 |
| Vertebrates | Freshwater fish and amphibians | 60 |
| Seawater fish | 49 |

**Table A 1-11.5. Diets of listed fish.**

| **Scientific Name** | **Common Name** | **Population/DPS/ESU** | **Algae** | **Aquatic plants** | **FW inverts** | **SW inverts** | **FW fish and amphibians** | **SW fish** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Acipenser brevirostrum* | Shortnose sturgeon |  | No | No | Yes | Yes | No | No |
| *Acipenser medirostris* | Green Sturgeon | Southern DPS | No | No | Yes | Yes | Yes | Yes |
| *Acipenser oxyrinchus (=oxyrhynchus) desotoi* | Gulf Sturgeon |  | No | No | Yes | Yes | No | No |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | Gulf of Maine DPS | No | No | Yes | Yes | Yes | Yes |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | New York Bight DPS | No | No | Yes | Yes | Yes | Yes |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | Chesapeake Bay DPS | No | No | Yes | Yes | Yes | Yes |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | Carolina DPS | No | No | Yes | Yes | Yes | Yes |
| *Acipenser oxyrinchus oxyrinchus* | Atlantic sturgeon | South Atlantic DPS | No | No | Yes | Yes | Yes | Yes |
| *Acipenser transmontanus* | White sturgeon |  | No | No | Yes | Yes | No | No |
| *Alosa alabamae* | Alabama shad |  | No | No | Yes | No | Yes | No |
| *Amblyopsis rosae* | Ozark cavefish |  | No | No | Yes | No | Yes | No |
| *Brosme brosme* | Cusk |  | No | No | No | Yes | No | Yes |
| *Carcharhinus longimanus* | Oceanic whitetip shark |  | No | No | No | Yes | No | Yes |
| *Catostomus discobolus yarrowi* | Zuni bluehead Sucker |  | Yes | No | No | No | No | No |
| *Catostomus santaanae* | Santa Ana sucker | 3 CA river basins | Yes | No | Yes | No | No | No |
| *Catostomus warnerensis* | Warner sucker |  | Yes | No | Yes | No | No | No |
| *Chasmistes brevirostris* | Shortnose Sucker |  | No | No | Yes | No | No | No |
| *Chasmistes cujus* | Cui-ui |  | Yes | No | Yes | No | No | No |
| *Chasmistes liorus* | June sucker |  | No | No | Yes | No | No | No |
| *Chrosomus saylori* | Laurel dace |  | No | No | Yes | No | No | No |
| *Cottus paulus (=pygmaeus)* | Pygmy Sculpin |  | No | No | Yes | No | No | No |
| *Cottus specus* | Grotto Sculpin |  | No | No | Yes | No | No | No |
| *Crenichthys baileyi baileyi* | White River springfish |  | Yes | Yes | Yes | No | No | No |
| *Crenichthys baileyi grandis* | Hiko White River springfish |  | Yes | Yes | Yes | No | No | No |
| *Crenichthys nevadae* | Railroad Valley springfish |  | Yes | No | Yes | No | No | No |
| *Crystallaria cincotta* | Diamond Darter |  | No | No | Yes | No | Yes | No |
| *Cyprinella caerulea* | Blue shiner |  | No | No | Yes | No | No | No |
| *Cyprinella formosa* | Beautiful shiner |  | No | No | Yes | No | No | No |
| *Cyprinodon bovinus* | Leon Springs pupfish |  | Yes | Yes | Yes | No | No | No |
| *Cyprinodon diabolis* | Devils Hole pupfish |  | No | No | Yes | No | No | No |
| *Cyprinodon elegans* | Comanche Springs pupfish |  | Yes | No | Yes | No | No | No |
| *Cyprinodon macularius* | Desert pupfish |  | Yes | Yes | Yes | No | No | No |
| *Cyprinodon nevadensis mionectes* | Ash Meadows Amargosa pupfish |  | Yes | No | Yes | No | No | No |
| *Cyprinodon nevadensis pectoralis* | Warm Springs pupfish |  | Yes | Yes | Yes | No | No | No |
| *Cyprinodon radiosus* | Owens pupfish |  | Yes | Yes | Yes | No | No | No |
| *Deltistes luxatus* | Lost River sucker |  | No | No | Yes | No | No | No |
| *Dionda diaboli* | Devils River minnow |  | Yes | No | Yes | No | No | No |
| *Elassoma alabamae* | Spring pygmy sunfish |  | No | No | Yes | No | No | No |
| *Empetrichthys latos* | Pahrump poolfish |  | Yes | Yes | Yes | No | No | No |
| *Epinephelus striatus* | Nassau Grouper |  | No | No | No | Yes | No | No |
| *Eremichthys acros* | Desert dace |  | Yes | Yes | Yes | No | No | No |
| *Erimonax monachus* | Spotfin Chub | except for experimental | No | No | Yes | No | No | No |
| *Erimonax monachus* | Spotfin Chub | Tellico River, TN | No | No | Yes | No | No | No |
| *Erimonax monachus* | Spotfin Chub | Shoal Creek | No | No | Yes | No | No | No |
| *Erimonax monachus* | Spotfin Chub | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(m)(1)(iii)) | No | No | Yes | No | No | No |
| *Erimystax cahni* | Slender chub | except for experimental | No | No | Yes | No | No | No |
| *Erimystax cahni* | Slender chub | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(s)(1)(i)) | No | No | Yes | No | No | No |
| *Etheostoma boschungi* | Slackwater darter |  | No | No | Yes | No | No | No |
| *Etheostoma chermocki* | Vermilion darter |  | No | No | Yes | No | No | No |
| *Etheostoma chienense* | Relict darter |  | No | No | Yes | No | No | No |
| *Etheostoma cragini* | Arkansas darter |  | Yes | Yes | Yes | No | No | No |
| *Etheostoma etowahae* | Etowah darter |  | No | No | Yes | No | No | No |
| *Etheostoma fonticola* | Fountain darter |  | No | No | Yes | No | No | No |
| *Etheostoma moorei* | Yellowcheek Darter |  | No | No | Yes | No | No | No |
| *Etheostoma nianguae* | Niangua darter |  | No | No | Yes | No | No | No |
| *Etheostoma nuchale* | Watercress darter |  | No | No | Yes | No | No | No |
| *Etheostoma okaloosae* | Okaloosa darter |  | No | No | Yes | No | No | No |
| *Etheostoma percnurum* | Duskytail darter | except for experimental | No | No | Yes | No | No | No |
| *Etheostoma percnurum* | Duskytail darter | Tellico River, TN | No | No | Yes | No | No | No |
| *Etheostoma percnurum* | Duskytail darter | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(q)(1)(ii)) | No | No | Yes | No | No | No |
| *Etheostoma phytophilum* | Rush Darter |  | No | Yes | Yes | No | No | No |
| *Etheostoma rubrum* | Bayou darter |  | No | No | Yes | No | No | No |
| *Etheostoma scotti* | Cherokee darter |  | No | No | Yes | No | No | No |
| *Etheostoma sellare* | Maryland darter |  | No | No | Yes | No | No | No |
| *Etheostoma sp.* | Bluemask (=jewel) Darter |  | No | No | Yes | No | No | No |
| *Etheostoma spilotum* | Kentucky arrow darter |  | No | No | Yes | No | No | No |
| *Etheostoma susanae* | Cumberland darter |  | No | No | Yes | No | No | No |
| *Etheostoma wapiti* | Boulder darter | except for experimental | No | No | Yes | No | No | No |
| *Etheostoma wapiti* | Boulder darter | Shoal Creek | No | No | Yes | No | No | No |
| *Eucyclogobius newberryi* | Tidewater goby |  | No | No | Yes | Yes | No | No |
| *Gambusia gaigei* | Big Bend gambusia |  | No | No | Yes | No | No | No |
| *Gambusia georgei* | San Marcos gambusia |  | No | No | Yes | No | No | No |
| *Gambusia heterochir* | Clear Creek gambusia |  | No | No | Yes | No | No | No |
| *Gambusia nobilis* | Pecos gambusia |  | No | No | Yes | No | No | No |
| *Gasterosteus aculeatus williamsoni* | Unarmored threespine stickleback |  | No | No | Yes | No | No | No |
| *Gila bicolor ssp.* | Hutton tui chub |  | Yes | No | Yes | No | No | No |
| *Gila bicolor ssp. mohavensis* | Mohave tui chub |  | Yes | No | Yes | No | Yes | No |
| *Gila bicolor ssp. snyderi* | Owens tui chub |  | Yes | No | Yes | No | Yes | No |
| *Gila boraxobius* | Borax Lake chub |  | Yes | No | Yes | No | No | No |
| *Gila cypha* | Humpback chub |  | Yes | No | Yes | No | No | No |
| *Gila ditaenia* | Sonora chub |  | Yes | No | Yes | No | No | No |
| *Gila elegans* | Bonytail chub |  | Yes | Yes | Yes | No | Yes | No |
| *Gila intermedia* | Gila chub |  | Yes | Yes | Yes | No | Yes | No |
| *Gila nigra* | Headwater chub |  | No | Yes | Yes | No | No | No |
| *Gila nigrescens* | Chihuahua chub |  | No | No | Yes | No | Yes | No |
| *Gila purpurea* | Yaqui chub |  | Yes | No | Yes | No | No | No |
| *Gila robusta* | Roundtail chub | Lower Colorado River Basin DPS | Yes | Yes | Yes | No | Yes | No |
| *Gila robusta jordani* | Pahranagat roundtail chub |  | Yes | No | Yes | No | Yes | No |
| *Gila seminuda (=robusta)* | Virgin River Chub |  | Yes | No | Yes | No | No | No |
| *Hippocampus zosterae* | Dwarf seahorse |  | No | No | No | Yes | No | No |
| *Hybognathus amarus* | Rio Grande Silvery Minnow | except for experimental | Yes | No | No | No | No | No |
| *Hybognathus amarus* | Rio Grande Silvery Minnow | Rio Grande, from Little Box Canyon to Amistad Dam | Yes | No | No | No | No | No |
| *Hypomesus transpacificus* | Delta smelt |  | No | No | Yes | Yes | No | No |
| *Ictalurus pricei* | Yaqui catfish |  | No | No | Yes | No | Yes | No |
| *Lamna nasus* | Porbeagle shark |  | No | No | No | Yes | No | Yes |
| *Lepidomeda albivallis* | White River spinedace |  | No | No | Yes | No | No | No |
| *Lepidomeda mollispinis pratensis* | Big Spring spinedace |  | Yes | No | Yes | No | No | No |
| *Lepidomeda vittata* | Little Colorado spinedace |  | Yes | Yes | Yes | No | Yes | No |
| *Manta birostris* | Giant manta ray |  | Yes | No | No | Yes | No | No |
| *Manta alfredi* | Reef manta ray |  | Yes | No | No | Yes | No | No |
| *Meda fulgida* | Spikedace |  | No | No | Yes | No | No | No |
| *Menidia extensa* | Waccamaw silverside |  | No | No | Yes | No | No | No |
| *Moapa coriacea* | Moapa dace |  | No | No | Yes | No | No | No |
| *Moxostoma sp.* | Sicklefin redhorse |  | No | No | Yes | No | No | No |
| *Mycteroperca fusca* | Island grouper |  | No | No | No | Yes | No | Yes |
| *Mycteroperca jordani* | Gulf grouper |  | No | No | No | Yes | No | Yes |
| *Narcine bancroftii* | Caribbean electric ray |  | No | No | No | Yes | No | Yes |
| *Notropis albizonatus* | Palezone shiner |  | No | No | Yes | No | No | No |
| *Notropis buccula* | Smalleye Shiner |  | No | No | Yes | No | No | No |
| *Notropis cahabae* | Cahaba shiner |  | Yes | No | Yes | No | No | No |
| *Notropis girardi* | Arkansas River shiner | Arkansas R. Basin | No | No | Yes | No | No | No |
| *Notropis mekistocholas* | Cape Fear shiner |  | No | Yes | No | No | No | No |
| *Notropis oxyrhynchus* | Sharpnose Shiner |  | No | No | Yes | No | No | No |
| *Notropis simus pecosensis* | Pecos bluntnose shiner |  | No | No | Yes | No | No | No |
| *Notropis topeka (=tristis)* | Topeka shiner | except for experimental | Yes | No | Yes | No | Yes | No |
| *Notropis topeka (=tristis)* | Topeka shiner | Northern Missouri Experimental Population | Yes | No | Yes | No | Yes | No |
| *Noturus baileyi* | Smoky madtom | except for experimental | No | No | Yes | No | No | No |
| *Noturus baileyi* | Smoky madtom | Tellico River, TN | No | No | Yes | No | No | No |
| *Noturus crypticus* | Chucky Madtom |  | No | No | Yes | No | No | No |
| *Noturus flavipinnis* | Yellowfin madtom | except for experimental | No | No | Yes | No | No | No |
| *Noturus flavipinnis* | Yellowfin madtom | Tellico River, TN | No | No | Yes | No | No | No |
| *Noturus flavipinnis* | Yellowfin madtom | Holston River, VA, TN | No | No | Yes | No | No | No |
| *Noturus flavipinnis* | Yellowfin madtom | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(e)(1)(iii)) | No | No | Yes | No | No | No |
| *Noturus placidus* | Neosho madtom |  | No | No | Yes | No | No | No |
| *Noturus stanauli* | Pygmy madtom | except for experimental | No | No | Yes | No | No | No |
| *Noturus stanauli* | Pygmy madtom | U.S.A. (TN - specified portions of the French Broad and Holston Rivers; see 17.84(t)(1)(i)) | No | No | Yes | No | No | No |
| *Noturus trautmani* | Scioto madtom |  | No | Yes | Yes | No | No | No |
| *Oncorhynchus (=Salmo) kisutch* | Coho salmon | Oregon Coast ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) kisutch* | Coho salmon | Southern Oregon - Northern California Coast ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) kisutch* | Coho salmon | Central California Coast ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) kisutch* | Coho salmon | Lower Columbia River ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Northern California DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Upper Columbia River DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | South-Central California Coast DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Central California Coast DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Upper Willamette River DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | California Central Valley DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Southern California DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Middle Columbia River DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Lower Columbia River DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Snake River Basin DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) mykiss* | Steelhead | Puget Sound DPS | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) nerka* | Sockeye salmon | Ozette Lake ESU | Yes | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) nerka* | Sockeye salmon | Snake River ESU | Yes | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Central Valley spring-run ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Snake River spring/summer-run ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Snake River fall-run ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Puget Sound ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | California Coastal ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Upper Columbia spring-run ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Lower Columbia River ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Sacramento River winter-run ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus (=Salmo) tshawytscha* | Chinook salmon | Upper Willamette River ESU | No | No | Yes | Yes | Yes | Yes |
| *Oncorhynchus aguabonita whitei* | Little Kern golden trout |  | No | No | Yes | No | No | No |
| *Oncorhynchus apache* | Apache trout |  | No | No | Yes | No | Yes | No |
| *Oncorhynchus clarki stomias* | Greenback Cutthroat trout |  | No | No | Yes | No | Yes | No |
| *Oncorhynchus clarkii henshawi* | Lahontan cutthroat trout |  | No | No | Yes | No | Yes | No |
| *Oncorhynchus clarkii seleniris* | Paiute cutthroat trout |  | No | No | Yes | No | No | No |
| *Oncorhynchus gilae* | Gila trout |  | No | No | Yes | No | No | No |
| *Oncorhynchus keta* | Chum salmon | Hood Canal summer-run ESU | No | No | Yes | No | Yes | No |
| *Oncorhynchus keta* | Chum salmon | Columbia River ESU | No | No | Yes | No | Yes | No |
| *Percina antesella* | Amber darter |  | No | No | Yes | No | No | No |
| *Percina aurolineata* | Goldline darter |  | No | No | Yes | No | No | No |
| *Percina aurora* | Pearl darter |  | No | No | Yes | No | No | No |
| *Percina jenkinsi* | Conasauga logperch |  | No | No | Yes | No | No | No |
| *Percina pantherina* | Leopard darter |  | No | No | Yes | No | No | No |
| *Percina rex* | Roanoke logperch |  | No | No | Yes | No | No | No |
| *Percina tanasi* | Snail darter |  | No | No | Yes | No | No | No |
| *Phoxinus cumberlandensis* | Blackside dace |  | Yes | No | Yes | No | No | No |
| *Plagopterus argentissimus* | Woundfin | except for experimental | Yes | Yes | Yes | No | No | No |
| *Plagopterus argentissimus* | Woundfin | Gila R. drainage, AZ, NM | Yes | Yes | Yes | No | No | No |
| *Poeciliopsis occidentalis* | Gila topminnow (incl. Yaqui) | U.S.A. only | No | Yes | Yes | No | Yes | No |
| *Pristis pectinata* | Smalltooth sawfish | United States DPS | No | No | Yes | Yes | Yes | Yes |
| *Ptychocheilus lucius* | Colorado pikeminnow (=squawfish) | except for experimental | No | No | Yes | No | Yes | No |
| *Ptychocheilus lucius* | Colorado pikeminnow (=squawfish) | Salt and Verde R. drainages, AZ | No | No | Yes | No | Yes | No |
| *Rhinichthys osculus lethoporus* | Independence Valley speckled dace |  | No | Yes | Yes | No | Yes | No |
| *Rhinichthys osculus nevadensis* | Ash Meadows speckled dace |  | No | No | Yes | No | No | No |
| *Rhinichthys osculus oligoporus* | Clover Valley speckled dace |  | No | Yes | Yes | No | No | No |
| *Rhinichthys osculus ssp.* | Foskett speckled dace |  | No | Yes | Yes | No | No | No |
| *Rhinichthys osculus thermalis* | Kendall Warm Springs dace |  | No | No | Yes | No | No | No |
| *Salmo salar* | Atlantic salmon | Gulf of Maine DPS | No | No | Yes | Yes | Yes | Yes |
| *Salvelinus confluentus* | Bull Trout | U.S.A., conterminous, lower 48 states | No | No | Yes | Yes | Yes | Yes |
| *Salvelinus confluentus* | Bull Trout | Clackamas River subbasin experimental population | No | No | Yes | Yes | Yes | Yes |
| *Scaphirhynchus albus* | Pallid sturgeon |  | No | No | Yes | No | Yes | No |
| *Scaphirhynchus suttkusi* | Alabama sturgeon |  | No | No | Yes | No | No | No |
| *Sebastes paucispinis* | Bocaccio | Puget Sound - Georgia Basin DPS | No | No | No | Yes | No | Yes |
| *Sebastes pinniger* | Canary rockfish | Puget Sound - Georgia Basin DPS | No | No | No | Yes | No | Yes |
| *Sebastes ruberrimus* | Yelloweye rockfish | Puget Sound - Georgia Basin DPS | No | No | No | Yes | No | Yes |
| *Speoplatyrhinus poulsoni* | Alabama cavefish |  | No | No | Yes | No | No | No |
| *Sphyrna lewini* | Scalloped Hammerhead Shark | Eastern Pacific DPS | No | No | No | Yes | No | Yes |
| *Sphyrna lewini* | Scalloped Hammerhead Shark | Central and Southwest Atlantic DPS | No | No | No | Yes | No | Yes |
| *Sphyrna lewini* | Scalloped Hammerhead Shark | Indo-West Pacific DPS | No | No | No | Yes | No | Yes |
| *Sphyrna zygaena* | Smooth hammerhead shark |  | No | No | No | Yes | No | Yes |
| *Spirinchus thaleichthys* | Longfin smelt San Francisco Bay delta population | San Francisco Bay delta DPS | No | No | Yes | Yes | No | No |
| *Thaleichthys pacificus* | Eulachon | Southern DPS | Yes | No | Yes | Yes | No | No |
| *Tiaroga cobitis* | Loach minnow |  | No | No | Yes | No | No | No |
| *Xyrauchen texanus* | Razorback sucker |  | No | No | Yes | Yes | No | No |

1. **Exposure models**

For direct effects to fish species and indirect effects to their prey, exposure to pesticides is assessed primarily using the Pesticide Root Zone Model (PRZM5) and the Variable Volume Water Model (VVWM) and Downstream Dilution tools. These tools generate exposure estimates based on location within the United State (HUC 2 region) and type of aquatic habitat (*e.g*., slow-flowing, shallow freshwater). To apply these tools, detailed range information is used to determine which HUC 2 regions a species occupies and detailed habitat information is used to assign the species to relevant aquatic habitats. Details of this procedure can be found in **ATTACHMENTS 1-6** and **1-10**.

1. **Habitat**

Listed fish species occupy both marine and freshwater aquatic habitats, with some inhabiting both during their life history (**Tables A 1-11.2** **and A 1-11.3**). For each fish species, the habitat is further defined with species-specific aquatic habitat bins used in exposure models (*e.g*., PRZM5/VVWM). **ATTACHMET 1-10** includes a description of the procedure for assigning species to aquatic habitat bins and a list of the aquatic bin assignments. More detail on the habitats, including source information, are provided in **SUPPLEMENRAL INFORMATION 3**.

1. **Obligate Relationships**

None of the listed species of fish are known to have obligate relationships with other organisms.

1. **Geographic Ranges of Listed Species**

Listed fish occur throughout the Unites States. County specific location information for each listed species, subspecies or ESU/DPS is provided in **SUPPLEMENTAL INFORMATION 3**. More detailed range info from the US Fish and Wildlife Service and National Marine Fisheries Service (*e.g*., range maps when available) is used to identify which HUC 2 region(s) to use in exposure models and to identify overlap between exposure and species (see **ATTACHMENT 1-6**).

1. **Strategy for grouping species**

In order to efficiently assess the risks of a pesticide to listed fish, it is necessary to group them by their defining features that are relevant in the context of the risk assessment framework. There are two major factors that impact the risk of a pesticide to a species: exposure and effects. In terms of effects, relevance of surrogate test species for a listed species may alter the confidence associated with the risk call. Surrogacy is determined by taxonomy, specifically whether toxicity data are available for species within the same order as the listed species. Therefore, species may be grouped according to their order (**Table A 1-11.2**). In terms of exposure, species are also grouped according to similarity of their use of habitats during their life stages (*e.g*., marine or freshwater) (**Table A 1-11.2**). Each group of species will share risk hypotheses and lines of evidence.

**SUPPLEMENTAL INFORMATION 1: Instructions for extracting biological information for listed fish**

The purpose of this project is to compile biological information on federally listed endangered and threatened, proposed or candidate fish species. This document contains instructions for extracting relevant biological information on each of these species and a form for entering this information.

**Instructions:**

Step 1. Each individual species and/or DPS/ESU will have information collected and entered on the template (**SUPPLEMENTAL INFORMATION 2**), which will create the species profile. This worksheet will be used to record relevant biological information for one of the listed species or DPS/ESU in the table above.

Step 2. Go to the species profile for the species of interest. This can be accessed by searching for the species on the US Fish and Wildlife Service (USFWS), or the National Marine Fisheries Service (NMFS) websites.

USFWS: http://www.fws.gov/endangered

NMFS: http://www.nmfs.noaa.gov/pr/species/esa

Step 3. Biological information is collected from documents hyperlinked on the USFWS or NMFS species profile pages. Information is collected only from service documents and service websites. Some examples of relevant documents include recovery plans, federal register rules designating critical habitat, and completed 5-year reviews. Information from the most recent documents will be given preference, unless there is specific information to indicate that older information is more accurate. All reference resources should be separately saved as pdf files.

Step 4. Extract the following biological information and record in the species or DPS/ESU spreadsheet (**SUPPLEMENTAL INFORMATION 2**):

Basic Information

* Species common name
* Species scientific name
* DPS or ESU
* Listed status (Endangered/Threatened)
* Designated critical habitat (Yes/No)
* Primary Constituent Elements (PCEs)
* Federal lands and Indian Reservations where species is known to occur
* Locations known to occur (states, county, or region)
* Water body names

Life History

* Population Size
* Does Population Growth or Modeling Information Exist? (Yes/No)
* Does Survival Rate Information Exist? (Yes/No)
* Lifespan (years)
* Type of Reproduction (Sexual/Asexual)
* Reproduction Period (Range in day/month)
* Age of First Reproduction/Maturation (in years)
* Reproduction Frequency
* Reproductive Output Rate Available (Yes/No)
* Sex Ratio Data Provided (Yes/No)
* Egg Fertility Rates Available? (Yes/No)
* Egg Hatching Rates Available? (Yes/No)
* Does Body Growth Information Exist? (Yes/No)
* Larval Body Length (cm)
* Juvenile Body Length (cm)

Biological information is recorded as attributes values and comments on those attributes. An attempt to keep attribute values as clear and concise as possible with further explanation in comments should be made. If information is not available for a particular attribute it is left blank.

Step 5 For each attribute value or comment, a reference should be placed in the spreadsheet, which includes page numbers and a URL link to the PDF. All information that appears in the species worksheet must have a source and must be highlighted in the original document. This is a critical component of the Quality Control (QC) for this project.

Step 6: Quality control (QC) of completed spreadsheets for listed species will involve confirmation all data entered into the spreadsheet accurately reflect the data contained in the original sources, and that all sources are cited.

*Note: Some qualities of life history (e.g. sexual v. asexual reproduction), habitat (e.g benthic, water-column life stages), and/or obligate relationships of a listed species may or may not be explicitly stated in the references documents. These attributes may be inferred from the description of the diet or habitat of the listed species. If during review of the documents and attribute spreadsheet it is determined that the listed species attribute while not explicitly stated but is implied based on the available scientific information the data collection/review scientists may determine these values are appropriate to populate.*

**SUPPLEMENTAL INFORMATION 2. Template for worksheet used to collect biological information on listed aquatic species**

See attached Excel file **Aquatic\_KB\_Worksheet\_Template.xlsx**.

**SUPPLEMTNAL INFORMATION 3. Species, subspecies or Distinct Population Segment-specific information for listed fish**

This attachment contains a summary of the biological and geographical information available (from the National Marine Fisheries Service and US Fish and Wildlife Service) for fish species, subspecies, Evolutionarily Significant Units (ESU), and Distinct Population Segments (DPS).

See attached Excel file **Compiled Fish.xlsx**.