

Endangered Species Act Section 7 Consultation
Programmatic Biological Opinion
on the
U.S. Environmental Protection Agency's
Issuance and Implementation of the Final Regulations
Section 316(b) of the Clean Water Act



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1.0 Consultation History

On July 9, 2004, U.S. Environmental Protection Agency (EPA) promulgated regulations establishing requirements for Cooling Water Intake Structures (CWIS) at existing facilities (69 FR 41576). On January 25, 2007, the Second Circuit remanded parts of the regulations to EPA (*Riverkeeper, Inc., v. EPA*, 475 F.3d 83 (2nd Circuit 2007)) holding that EPA impermissibly balanced costs and benefits in developing the requirements. On July 9, 2007, EPA suspended the regulations (72 FR 37107). On April 1, 2009, the U.S. Supreme Court reversed, holding that EPA could consider costs and benefits in its regulatory decisions under section 316(b) (*Entergy Corp. v. Riverkeeper, Inc.*, 556 U.S. 208 (2009)).

On November 22, 2010, EPA signed a settlement agreement with Riverkeeper, Inc. to establish rulemaking dates, which included final action by July 27, 2012. On July 17, 2012, the parties agreed to an amendment to extend the date for the final Rule until July 27, 2013.

On April 20, 2011, pursuant to section 316(b) of the Clean Water Act (CWA), EPA proposed regulations establishing requirements for CWISs at existing facilities (76 FR 22174). In its proposed Rule, EPA replaces with amendments the suspended regulations establishing requirements for CWISs at existing facilities.

On July 20, 2012, EPA met with the National Marine Fisheries Service (NMFS) to commence informal ESA Section 7(a)(2) consultation.

On October 1, 2012, EPA met with the U.S. Fish and Wildlife Service (USFWS) to commence informal ESA section 7 consultation. The USFWS and NMFS (i.e., the Services) met with EPA numerous times to discuss their action, its impacts to listed species, and measures to minimize impacts.

On April 4, 2013, EPA sent the Services an early draft of the Rule.

On April 12, 2013, the Services provided comments on the early draft of the Rule.

On June 18, 2013, EPA submitted a section 7 consultation initiation package, which included the draft Rule, draft Preamble, and biological evaluation. We initiated formal consultation on June 18, 2013.

On June 27, 2013, EPA signed a modified settlement agreement with Riverkeeper, Inc. to extend the date for the final Rule until November 4, 2013, to allow for the completion of formal section 7 consultation with the Services. This deadline was subsequently extended to January 14, 2014 and then to April 17.

Between June 27 and November 4, the Services met with EPA frequently to discuss EPA's action.

On November 4, 2013, we received a revised version of the proposed 316(b) Rule from Office of Management and Budget.

On November 15, 2013, we sent the Description of the Action to EPA for review.

On November 26, 2013, EPA sent corrections and comments on the Description of the Action and we incorporated their edits into the final Description of the Action.

From December 6, 2013, through March 11, 2014, the Services and EPA engaged in numerous exchanges about possible revisions to the processes embodied in EPA's draft final Rule.

On March 14, 2014, EPA sent the Services the final Rule and Preamble.

On March 31, 2014, the Services provided EPA with a document seeking clarification on the Services' understandings of key elements in EPA's proposed action).

On April 8, 2014, EPA provided confirmation on the Services' description and understanding of the key elements of EPA proposed action. (Attached as Appendix A)

2.0 Description of the Proposed Action

EPA proposes to issue and implement a final Rule to establish requirements for CWIS at existing facilities and modify certain requirements for new facilities under an existing rule. EPA will amend specific parts of the Rule, which implement section 316(b) of the CWA, that had previously been suspended (72 FR 37107) in response to the 2nd Circuit Court of Appeals' decision in *Riverkeeper, Inc., v. EPA*. These parts include: 40 CFR 122.21 (r) (1)(ii) and (5), 125.90 (a), (c), and (d), and 125.91 through 125.99. In response to the Court's remand, EPA in its final regulation also proposes to remove the restoration-based compliance alternative and associated monitoring and demonstration requirements for new facilities (125.84(c) and (d)(1))¹. In addition, EPA proposes to modify other parts of its regulations implementing section 316(b) to establish new requirements for all existing power generating facilities and existing manufacturing and industrial facilities that withdraw more than two million gallons of water per day (mgd) from waters of the United States and use at least 25 percent of the water they withdraw exclusively for cooling purposes (76 FR 22173). In summary, in response to litigation, EPA will issue a final Rule to establish modified or new requirements for facilities that withdraw water for CWIS.

Section 316(b) of the CWA requires that the location, design, construction, and capacity of CWIS reflect the best technology available (BTA) for minimizing adverse environmental impacts. Under the regulation, the term "cooling water intake structure" means the total physical structure and any associated waterways used to withdraw cooling water from waters of the United States. For purposes of the final Rule, adverse environmental impacts include, but are not

¹ The removal of the restoration-based compliance alternative and associated monitoring and documentation requirements for new facilities are non-discretionary actions on the part of EPA and therefore, the effects of these actions are not being addressed in this biological opinion.

limited to, impingement and entrainment at CWIS, including adverse effects to federally-listed species (species listed as threatened or endangered under the ESA or ESA-listed species) and designated critical habitat, and changes in flow regime, caused by the withdrawal of water. Impingement is defined as the entrapment of any life stages of fish and shellfish on the outer part of an intake structure or against a screening device during periods of intake water withdrawal. Entrapment is defined as the condition where impingeable fish and shellfish lack the means to escape the cooling water intake. Entrainment is defined as any life stages of fish and shellfish in the intake water flow entering and passing through a cooling water intake structure and into a cooling water system, including the condenser or heat exchanger.

EPA tailored the Rule toward the protection of fish and shellfish. However, federally-listed aquatic organisms that do not fall into the classification of fish and shellfish are also impacted by impingement, entrainment, and entrapment (e.g., manatees, turtles). The Rule provides that the Director may establish in the permit additional control measures, monitoring and reporting requirements that are designed to minimize incidental take, reduce or remove more than minor detrimental effects (as defined on page 4 of this Opinion) to federally-listed species and designated critical habitat, or avoid jeopardizing federally-listed species or destroying or modifying designated critical habitat. As such, and based on communication received from EPA on April 8, 2014, (Appendix A), the Rule's application to "fish and shellfish" and the Director's authority to establish additional measures to protect listed species and habitat will encompass all taxa of listed species, including their critical habitat. This consultation also considers the direct and indirect effects to federally-listed species caused by facilities operating CWIS under requirements of the Rule, including but not limited to; impingement, entrainment, loss of prey, changes in water quality, and flow alteration.

The Rule regulates existing facilities and new units at existing facilities that withdraw cooling waters from waters of the United States and have, or require, a National Pollutant Discharge Elimination System (NPDES) permit, issued under section 402 of the CWA. The NPDES permit program is administered by State Directors in authorized States. However, EPA retains the NPDES permit program for facilities located in: Idaho, Massachusetts, New Hampshire, New Mexico, District of Columbia, American Samoa, Guam, Johnston Atoll, Midway Island, Northern Mariana Islands, Puerto Rico, and Wake Island, as well as certain Federal facilities and facilities located on Tribal Lands.

The Rule applies to owners or operators of existing facilities with CWISs that withdraw > 2 mgd and use at least 25 percent of the water for cooling purposes. It also applies to the State or EPA Regional Director (i.e., the Director²), who establishes controls under CWA Section 316(b) authority on withdrawals through the NPDES permitting process. Regulatory requirements are described in full in the Rule (40 CFR 122 and 40 CFR 125) and further explained in the Preamble. Here, we summarize the Rule, Preamble and relevant correspondence from EPA to describe EPA's action with sufficient detail to evaluate its impact on ESA-listed species and designated critical habitat.

² See 40 CFR 122.2 for the Definition of Director as used in the Rule.

2.1 EPA Requirements

When EPA is the NPDES permitting authority and has determined the issuance of the permit may affect ESA-listed species or designated critical habitat, they then must request consultation under section 7(a)(2) of the ESA. As discussed in Section 2.3, regarding State or Tribal-issued CWIS permits, in the Preamble, EPA reaffirms its commitment to the procedures stipulated in the 2001 Memorandum of Agreement (MOA) signed by EPA, and the Services (66 FR 11202). EPA has incorporated as part of its action relevant sections of the MOA, as described in the Preamble to the Rule and, based on correspondence with EPA received on April 8, 2014 (attached as Appendix A), EPA commits to the following implementation of their NPDES oversight authorities in situations where the Services contact EPA with concerns that a State or Tribal permit will have more than minor detrimental effects on federally-listed species or critical habitat that cannot be resolved with the State or Tribal permitting authority:

- i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
- ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - o Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

EPA has stated adverse environmental impacts include adverse effects to listed species (USEPA 2013f), and Section 316(b) of the CWA requires that the location, design, construction, and capacity of CWIS reflect the BTA for minimizing adverse environmental impacts. Further, the phrase "more than minor detrimental effects" as used in the Rule, Preamble to the Rule, the 2001 MOA, and in EPA's commitment to the implementation of their NPDES oversight authorities as described above, means "adverse effects" as that term is used in the ESA implementing regulations, consultation handbook, and MOA (66 FR 11207) and is one type of "adverse environmental impact" as that term is used under section 316(b) of the CWA. EPA has also defined minimize in the Rule as "to reduce to the smallest amount, extent, or degree reasonably possible." In summary, EPA will exercise its oversight authority on proposed/draft permits where the Services contact EPA with concerns that a State or Tribal permit will have more than minor detrimental effects on Federally-listed species or designated critical habitat. Such situations may include where a permit does not minimize adverse effects to listed species to the smallest amount, extent, or degree reasonably possible.

2.2 Owner or Operator Requirements

In the Rule, EPA establishes certain requirements of the owner or operator of an existing facility

with CWIS by indicating the owner or operator “must” or “shall” perform some action. EPA also allows discretion by indicating that the owner or operator “may” or “should” perform some optional task. For the purposes of this biological opinion (Opinion), we focus on requirements of the rule because we must evaluate the Federal action (not the discretionary decisions of owners, operators, or Directors) and whether EPA has met their obligations under section 7(a)(2) of the ESA. Therefore, we focus on the requirements (i.e., “must” or “shall”) established in the Rule; however, we describe and consider optional tasks (i.e., “may” or “should”) to characterize discretion allowed in the Rule.

2.2.1 Permit Application

EPA requires the owner or operator of a facility with CWIS to submit information to the Director, as described in Table 1.

Table 1. Summary of information requirements, based on facility and unit type. For details, see 40 CFR 122.21(r) and 125.95. Numbers 2 – 14 refer to sections in §122.21(r), described in brief below table; “X” means required. Abbreviations: million gallons per day (mgd); actual intake flow (AIF); design intake flow (DIF).

Information required	Existing facilities			
	Closed cycle*	Open cycle		
		Existing units		New units
		≤125 mgd	>125 mgd	
2-Source water physical data	X	X	X	X
3-CWIS data	X	X	X	X
4-Source water baseline biological data	X	Applicable provisions	Applicable provisions	Applicable provisions
5-CWIS system data	X	X	X	X
6-Impingement mortality standard method	X	X	X	Applicable provisions
7-Entrainment performance studies		X	X	Applicable provisions
8-Operational status	X	X	X	X
9-Entrainment characterization study	Unless waived		X	X if > 125 mgd or if 125.94(e)(2)
10-Comprehensive technical feasibility and cost evaluation	Unless waived		X	X if > 125 mgd

Information required	Existing facilities		
	Closed cycle*	Open cycle	
		Existing units	
		≤125 mgd	>125 mgd
study			
11-Benefits valuation study	Unless waived	X	X if > 125 mgd
12-Non-water quality environmental and other impacts study	Unless waived	X	X if > 125 mgd
13-Peer review	Unless waived	X	X if > 125 mgd
14-Method of compliance for new units			X
Additional information required		See §125.98	See § 122.21(r)(14), 125.95(d), and 125.98(i)

*Closed-cycle recirculating system is defined by EPA as a system designed and properly operated using minimized make-up and blowdown flows withdrawn from a water of the United States to support contact or noncontact cooling uses within a facility, or a system designed to include certain impoundments; it passes cooling water through the condenser and other components of the cooling system and reuses the water for cooling multiple times. It may include a facility with wet, dry, or hybrid cooling towers; it withdraws new source water (make-up water) only to replenish losses that have occurred due to blowdown, drift, and evaporation. The definition also includes a system with impoundments of waters of the U.S. where the impoundment was constructed prior to the effective date of this rule and created for the purpose of serving as part of the cooling water system as documented in the project purpose statement for any required Clean Water Act section 404 permit obtained to construct the impoundment.

2. Water body description, characterization, and drawings/maps; 3. Configuration, coordinates, operation schedule, flow regime, and drawings; 4. Species, life stages, abundance, reproduction/recruitment, impingement/entrainment potential, protective measures; 5. Description, calculations, performance, impingement/entrainment technology performance; 6. Impingement mortality standard compliance method and studies; 7. Entrainment technology efficacy, entrainment survival data; 8. Description of units, capacity, upgrades, operating status; 9 – 13. For facilities with an actual intake flow of greater than 125 mgd. 14. Compliance method for new unit.

In lieu of the information required at 122.21(r)(4)(vi), the owner or operator of an existing facility or new unit at an existing facility must, based on readily available information at the time of the permit application, identify all federally-listed species and/or designated critical habitat that are or may be present within their action area. In correspondence received from EPA on April 8, 2014, EPA verified the following clarifications to the preceding statement:

- i. “Readily available information” means information that is publicly available information, and includes information obtained from the Services. “Readily available information” is not limited to information that is in the facility’s

- possession; however, facilities are not required to create new information (e.g. new studies or surveys) in order to identify federally-listed threatened and endangered species and/or designated critical habitat in their action area; and
- ii. In the Preamble to the Rule, EPA describes the phrase “action area” in the following way: “The action area can generally be considered the area in the vicinity of the cooling water intake structure.” In the April 8, 2014, correspondence, EPA verified that whenever the phrase “action area” is used in the Preamble and Rule, it is to be interpreted in a manner consistent with the definition as found in the Services’ regulations implementing ESA Section 7 at 50 CFR 402.02. In other words, “action area” includes all areas that may be directly or indirectly affected by the operation of a facility’s CWIS.

The owner or operator of a facility may, in subsequent permit applications, request to reduce the information required, if conditions at the facility and in the water body remain substantially unchanged since the previous application so long as the relevant previously submitted information remains representative of current source water, intake structure, cooling water system, and operating conditions. Any habitat designated as critical or species listed as threatened or endangered after issuance of the current permit, whose range of habitat or designated critical habitat includes waters where a facility’s intake is located constitutes potential for a substantial change that must be addressed by the owner/operator in subsequent permit applications, unless the facility received an exemption pursuant to 16 U.S.C. 1536(o) or permit pursuant to 16 U.S.C. 1539(a) or there is no reasonable expectation of take. The owner or operator of a facility must submit a request for reduced information requirements regarding cooling water intake structure and waterbody information to the Director at least two years and six months prior to the expiration of its current NPDES permit. The owner or operator’s request must identify each element that it determines has not substantially changed since the previous permit application and the basis for the determination. The Director has the discretion to accept or reject any part of the request. The owner or operator of a facility must certify that its permit application is true, accurate and complete pursuant to § 122.22(d).

The Director may waive some or all information requirements of 40 CFR 122.21(r) if the intake is located in a manmade lake or reservoir and the fisheries are stocked and managed by a State or Federal natural resources agency or the equivalent. If the man-made lake or reservoir contains federally-listed threatened or endangered species or designated critical habitat, such a waiver shall not be granted.

2.2.3 BTA Standards for Impingement Mortality

EPA requires owners or operators to comply with one of following BTA Standards for Impingement Mortality, explained in detail in 40 CFR 125.94(c) and summarized below:

- 1) Closed-cycle recirculating system and daily monitoring of actual intake flows; or
- 2) Demonstrated ≤ 0.5 ft/sec through-screen design velocity; or
- 3) Demonstrated ≤ 0.5 ft/sec through-screen actual velocity* and daily monitoring of velocity; or
- 4) Existing offshore velocity cap and daily monitoring of intake flow; or
- 5) Modified traveling screens, optimized to minimize impingement mortality; or
- 6) BTA** systems of technology, management practices, and operational measures; or

7) 12-month impingement mortality performance standard and monthly monitoring:

$$\frac{\text{\# fish killed***}}{\text{\# fish impinged}} < 24 \text{ percent}$$

*Director may authorize the operator to exceed 0.5 fps for brief periods

**Determined by the Director

***After collected or retained in ≤ 0.56 inch sieve and held for 18 to 96 hours, or other Director specified period

Pursuant to the Rule, the owner or operator must also comply with any additional measures for shellfish and fragile species, as established by the Director. Fragile species as defined in the Rule means those species of fish and shellfish that are least likely to survive any form of impingement and have an impingement survival rate of less than 30 percent. The owner or operator of an existing facility with CWIS used for electric generating unit(s), each with an annual average capacity utilization rating of less than 8 percent (averaged over a 24-month contiguous period), may request that the Director establish site-specific BTA standards for impingement mortality that are less stringent than the Impingement Mortality Standards described above.

The Rule includes provisions for *de minimis* rates of impingement. In limited circumstances, rates of impingement may be so low at a facility that additional impingement controls may not be justified. In correspondence received from EPA on April 8, 2014 (attached as Appendix A), EPA verified that “where a Director determines, pursuant to §125.94(c)(11), that a facility’s rate of impingement is so exceptionally low as to not warrant additional impingement controls, the Services may still consider the detrimental effects of the facility operation to be more than minor if Federally-listed threatened or endangered species are subject to impingement.” The Services may therefore still recommend species protection measures. For threatened and endangered species, all unauthorized take is prohibited by the ESA.

Where required by the Director, the owner or operator must implement any requirements for additional control measures, monitoring, and reporting that are designed to minimize incidental take, reduce or remove more than minor detrimental effects to federally-listed species and designated critical habitat, or avoid jeopardizing federally-listed species or destroying or adversely modifying designated critical habitat (e.g., prey base). Such control measures, reporting, and monitoring requirements may include measures or requirements that may have been identified by the Services during their 60 day review of the permit application or the public comment period.

Prior to the effective date of this rule, the owner or operator of an existing facility with a cumulative design intake flow (DIF) greater than 2 mgd is subject to site-specific impingement mortality and entrainment requirements as determined by the Director on a case-by-case Best Professional Judgment basis. On or after the effective date of this rule, the owner or operator of an existing facility with a cumulative design intake flow (DIF) greater than 2 mgd is subject to the BTA standards for impingement mortality under paragraph 125.94(c) of the rule, and entrainment under paragraph 125.94(d) of the rule including any measures to protect Federally-listed threatened and endangered species and designated critical habitat established under paragraph 125.94(g) of the rule. After issuance of a final permit that establishes the entrainment

requirements, EPA requires the owner or operator of an existing facility to comply with the impingement mortality standard as soon as practicable. The owner or operator of a new unit at an existing facility must comply with the BTA standards in paragraph § 125.94(e) with respect to the new unit upon commencement of the new unit's operation.

2.2.4 BTA Standards for Entrainment

The Rule requires the Director to establish requirements that reflect the BTA standards for entrainment for each CWIS on a site-specific basis that must reflect the maximum reduction in entrainment warranted by §125.98 of the Rule. The owner or operator of an existing facility must comply with BTA standard for entrainment, as determined by the Director.

The owner or operator of a new unit at an existing facility must achieve the impingement mortality and entrainment standards by: (1) reducing design intake flow for the new unit, at a minimum, to a level commensurate with that which can be attained by the use of a closed-cycle recirculating system for the same level of cooling for the new unit; or (2) demonstrating to the Director that they will operate and maintain technologies for the intake flow serving the new unit that demonstrate entrainment reductions equivalent to at least 90 percent of the reduction that could be achieved through compliance with intake flow commensurate with a closed-cycle system (i.e., 125.92(c)(1)). Exceptions are described in the Rule, and the Director may establish alternative requirements or additional BTA standards for entrainment on a site-specific basis.

Where required by the Director, the owner or operator must implement any requirements for additional control measures, monitoring, and reporting that are designed to minimize incidental take, reduce or remove more than minor detrimental effects to federally-listed species and designated critical habitat, or avoid jeopardizing federally-listed species or destroying or adversely modifying designated critical habitat. Such control measures, reporting, and monitoring requirements may include measures and requirements that may have been identified by the Services during their 60 day review of the permit application or the public comment period.

Prior to 42 months after the effective date of the rule, the Director determines on a case-by-case basis when the facility becomes subject to site-specific entrainment requirements; after 42 months after the effective date of the rule, the owner or operator is subject to the entrainment standard. After issuance of a final permit that establishes the entrainment requirements, EPA requires the owner or operator of an existing facility to comply with the entrainment standard as soon as practicable, based on a schedule of requirements established by the Director. The owner or operator of a new unit at an existing facility must comply with the impingement mortality standard upon commencement of the new unit's operation.

2.2.5 Monitoring

EPA has established monitoring requirements for some of the BTA Standards for Impingement Mortality, described above. The owner or operator complying with the 12-month impingement mortality performance standard (§125.94(c)(7)) may request the Director to reduce monitoring requirements after the first full permit term in which these monitoring requirements are implemented, if the facility's CWIS does not directly or indirectly affect federally-listed species or designated critical habitat. To do so, the results of the monitoring to date must demonstrate that the owner or operator of the facility has consistently operated the intake as designed and is

meeting the impingement mortality standard. In addition, the Director will determine entrainment monitoring requirements on a site-specific basis, as appropriate, to achieve the maximum reduction in entrainment warranted. The Director may require additional monitoring for a variety of reasons as specified in §125.96 of the Rule, including additional monitoring for federally-listed species. Where the Director requires additional monitoring for federally-listed species or critical habitat, the owner/operator must implement such monitoring.

The owner or operator of a new unit at an existing facility must either: (option 1) monitor flow intake daily and under normal operating conditions, to determine whether the levels are commensurate with that which can be attained by the use of a closed-cycle recirculating system; or (option 2) continue monitoring entrainment, to demonstrate entrainment reductions are commensurate with a closed-cycle recirculating system. If an owner/operator chooses to continue monitoring entrainment (option 2), the owner or operator of a new unit at an existing facility must monitor entrainable organisms at a proximity to the intake that is representative of the entrainable organisms in the absence of the intake structure. They must also monitor the latent entrainment mortality in front of the intake structure. Latent mortality is defined as the delayed mortality of organisms that were initially alive upon being impinged or entrained but that do not survive the delayed effects of impingement and entrainment during an extended holding period. Mortality after passing the cooling water intake structure must be counted as 100 percent mortality, unless the owner or operator has demonstrated to the approval of the Director that the mortality for each species is less than 100 percent.

Monitoring must be representative of the cooling water intake when the structure is in operation. In addition, sufficient samples must be collected to allow for calculation of annual average entrainment levels of all life stages of fish and shellfish. The Director will determine specific monitoring protocols and frequency of monitoring. The owner or operator of a new facility must follow the monitoring frequencies identified by the Director for at least 2 years after the initial permit issuance. After that time, the Director may approve a request for less frequent monitoring in the remaining years of the permit term and when subsequent permits are issued. The monitoring must measure the total count of entrainable organisms or density of organisms, unless the Director approves of a different metric for such measurements. In addition, the owner or operator must monitor the actual intake flow for each intake. The actual intake flow must be measured at the same time as the samples of entrainable organisms are collected. The Director may require additional monitoring necessary to demonstrate compliance with the entrainment standard.

EPA requires an owner or operator of an existing facility to either conduct visual inspections or employ remote monitoring devices during the period the cooling water intake structure is in operation. The owner or operator must conduct such inspections at least weekly to ensure that any technologies operated to minimize adverse environmental impact using BTA standards are maintained and operated to function as designed, including those installed to protect federally-listed species or designated critical habitat. The Director may establish alternative procedures if this requirement is not feasible (e.g., an offshore intake, velocity cap, or during periods of inclement weather).

2.2.6 Reporting

EPA requires the owner or operator to submit to the Director the following information:

- Monitoring Reports (Discharge Monitoring Reports or equivalent state reports and results of all monitoring; demonstrations, and other information required by the permit sufficient to determine compliance with the permit conditions and requirements established under § 125.94(g);
- Status reports required by the Director;
- Signed annual certification statement and report (indicating substantial modifications, if any);
- Additional supplemental permit reporting, as determined by the Director; and
- Where the Director requires additional reporting for federally-listed species or critical habitat, the owner/operator must provide such reporting.

In addition, the Director may require supplemental recordkeeping, such as compliance and other monitoring or supplemental data collection required in the permit application.

The owner or operator of a facility must keep records of all permit application submissions until the subsequent permit is issued to document compliance. If the Director approves a request for reduced permit application studies, the owner or operator of a facility must keep records of all submissions that are part of the previous permit application until the subsequent permit is issued. The owner or operator must keep all records supporting the Director's determination of BTA for the entrainment standard until it is revised by the Director.

2.2.7 Incidental Take

The Rule does not authorize take of endangered or threatened species. Under the ESA, take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct (16 USC 1532(19)), of endangered or threatened species. Harm is defined by the Services to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is further defined by the USWFS as actions that create the likelihood of injury to listed species by annoying them 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). Because EPA defines impingement as entrapment and entrainment as entering or passing through a CWIS and into the cooling water system, and we interpret these as examples of "trap," "capture," and "harass," we have determined that any impingement or entrainment of federally-listed species constitutes take. As cited in the Rule, incidental take of endangered species (and threatened species, as applicable, under 16 U.S.C. 1533(d)) is prohibited under the ESA (16 U.S.C. 1538), unless it is permitted (16 U.S.C. 1539(a)) or exempted (16 U.S.C. 1536(o)) by the Services. Absent such exemption or permit, any facility operating under the authority of this Rule must not take federally threatened or endangered species.

2.3 Director Requirements

In the Rule, EPA establishes many requirements of the Director by indicating that the Director "must" or "shall" perform some action. EPA also provides discretion by indicating that the Director "may" or "should" perform some optional task. For the purposes of this Opinion, we focus on requirements because we must evaluate the Federal action (not the discretionary decisions of Directors) and whether EPA's action is not likely to jeopardize the continued

existence of any federally-listed species or result in the destruction or adverse modification of designated critical habitat. Therefore, we focus on the requirements (“must” or “shall”) established in the Rule; however, we describe and have considered the optional elements of the Rule (“may” or “should”) to characterize the extent of discretion allowed in the Rule.

2.3.1 Permit Application

EPA requires the Director to review the materials submitted by the applicant (see Table 1) for completeness at the time of initial permit application and before each permit renewal or reissuance.

2.3.2 Permitting Requirements

Section 316(b) requirements are implemented through a NPDES permit. EPA requires the Director to determine the requirements and conditions to include in the permit, based on the information submitted in the permit application, and EPA’s 316(b) regulations. Under the regulation, the permit must include:

- The following language as a permit condition: “Nothing in this permit authorizes take for the purposes of a facility’s compliance with the Endangered Species Act.”
- At minimum, the monitoring and reporting requirements described above.
- For permits issued after 42 months after the effective date of the rule:
 - At a minimum, conditions to implement and ensure compliance with the impingement mortality and entrainment standards, including any measures to protect ESA-listed species and designated critical habitat required by the Director.
 - Conditions, management practices, and operational measures necessary to ensure proper operation of any technology used to comply with the impingement mortality standard and the entrainment standard.
- For permits issued before 42 months after the effective date of the rule, or permits issued after but applied for before the effective date of the final rule, the Director must establish interim BTA requirements in the permit on a site-specific basis, based on the Director’s best professional judgment.
- If modified screens or BTA systems of technology, management practices, and operational measures are selected as the BTA Standard for Impingement Mortality, the permit must include operational measures and best management practices identified in the impingement technology performance optimization study as described in §122.21(r)(6) of the Rule and deemed as necessary by the Director to ensure optimized operation of the modified traveling screens or other systems of technologies.

The permit may include requirements for the protection of federally-listed species and designated critical habitat, including:

- Additional control measures, monitoring requirements, and reporting requirements that are designed to minimize incidental take, reduce or remove more than minor detrimental effects to federally-listed species and designated critical habitat, or avoid jeopardizing federally-listed species or destroying or adversely modifying designated critical habitat (e.g. prey base). Such control measures, monitoring requirements, and reporting requirements may include measures or requirements identified by the U.S. Fish and Wildlife Service and/or the National Marine Fisheries Service during the 60 day review

period pursuant to 125.98(h) or the public notice and comment period pursuant to 40 C.F.R. 124.10;

- As described in the Preamble of the Rule and further clarified in correspondence received from EPA on April 8, 2014, in situations where the Services have provided the Director control measures, monitoring, or reporting recommendations for the protection of federally-listed species or designated critical habitat, and the permit will have more than minor detrimental effect on federally-listed species or critical habitat that cannot be resolved with the State or Tribal permitting authority:
 - i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
 - ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
 - iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

The Director may require additional permit requirements if:

- There are migratory or sport or commercial species subject to entrainment that may be directly or indirectly affected by the CWIS, based on information submitted to the Director by any fishery management agency or other relevant information; or
- It is determined by the Director, based on information submitted by any fishery management agencies or other relevant information, that the facility, after meeting the entrainment standard of this section, would still result in undesirable cumulative stressors to ESA-listed and proposed species and designated and proposed critical habitat.
- For permits expiring prior to or on the date 42 months after the effective date of the rule, for which the Director has established an alternate schedule for submission of the permit application information (see Table 1), permit conditions to ensure that, for any subsequent permit, the Director will have all the information required to establish BTA impingement and entrainment requirements.
- For permits applied for before, but issued after the final Rule, the Director may include permit conditions to ensure that all the information necessary to establish BTA impingement and entrainment requirements for the subsequent permit is included.
- For new units at existing facilities, the Director may establish alternative requirements if:
 - 1) the data specific to the facility indicate that compliance with the requirements is commensurate with closed cycle recirculating system design intake flow; 2) or
 - entrainment reductions for each new unit would result in compliance costs wholly out of proportion to the costs EPA considered in establishing the requirements at issue, would

result in significant adverse impacts on local air quality or local water resources other than impingement or entrainment, or significant adverse impacts on local energy markets:

- The alternative requirements must achieve a level of entrainment reduction that is equivalent to 90 percent or greater of the reduction that could be achieved with closed cycle recirculating system, as described above;
- The alternative requirements must ensure compliance with these regulations other provisions of the CWA and state and tribal law;
- The burden is on the owner or operator of the facility requesting the alternative requirement to demonstrate that alternative requirements should be authorized for the new unit.
- Additional measures are needed, such as seasonal deployment of barrier nets, to protect shellfish;
- Additional technologies are needed for protection of fragile species; and
- Additional study and monitoring if a threatened or endangered species has been identified in the vicinity of the intake.

The Director may waive some or all of the information requirements (see Table 1) if the intake is located in a man-made lake or reservoir and the fisheries are stocked and managed by a State or Federal natural resources agency or the equivalent; however, if the man-made lake or reservoir contains federally-listed species or designated critical habitat, such a waiver shall not be granted.

2.3.3 Impingement

When the Director establishes a schedule of BTA requirements, the schedule must provide for compliance with impingement mortality and entrainment standards as soon as practicable.

If the owner or operator chooses to comply with the BTA Standard for Impingement Mortality with modified traveling screens or systems of technology, management practices, and operational measures, and the Director concludes that the study does not establish that the proposed technology is the best technology available for impingement reduction for the site, then the Director must determine other impingement reduction controls for the facility. The Director may request further monitoring and information as part of the “impingement technology performance optimization study,” including extending the study period beyond two years. The Director may waive all or part of the impingement technology performance optimization study after the first permit cycle after the rule wherein the permittee is deemed in compliance with the BTA Standard for Impingement Mortality.

Depending on a facility’s choice to comply with the BTA Standard for Impingement Mortality, the Director may approve of impinged fish being returned to water sources other than the original source water, taking into account any recommendations from the Services with respect to endangered or threatened species. Based on correspondence received from EPA on April 8, 2014, EPA verified that Directors will address any concerns from the Services regarding the return of aquatic species to waters other than their source waters. If the Services’ concerns are not addressed and the permit would cause more than minor detrimental effects, the permit will be subject to the EPA oversight provisions as described above.

2.3.4 Entrainment

When the Director establishes a schedule of BTA requirements, the schedule must provide for

compliance with impingement mortality and entrainment standards as soon as practicable.

The Rule requires the Director to establish BTA requirements for entrainment for each intake on a site-specific basis. The Director must establish site-specific requirements for entrainment after reviewing the information submitted by the owner or operator (see Table 1). These entrainment requirements must reflect the Director's determination of the maximum reduction in entrainment warranted after consideration of factors relevant for determining the BTA for minimizing adverse environmental impact at each facility. These entrainment requirements may also reflect any control measures to reduce entrainment of federally-listed species and designated critical habitat (e.g. prey base). The Director may reject an otherwise available technology as a basis for entrainment requirements if the Director determines, among other things, there are unacceptable adverse impacts, including: impingement, entrainment, or other adverse effects to federally-listed species or designated critical habitat. Prior to any subsequent permit issuance after the date 42 months after the effective date of the rule, the Director must review the performance of the facility's installed entrainment technology to determine whether it continues to meet the requirements of the BTA entrainment standards for existing facilities.

The Director must provide a written explanation of the proposed entrainment determination in the fact sheet or statement of basis for the proposed permit. The written explanation must describe why the Director has rejected any entrainment control technologies or measures that perform better than the selected technologies or measures, and must reflect consideration of all reasonable attempts to mitigate any adverse impacts of otherwise available better performing entrainment technologies. The proposed determination in the fact sheet or statement of basis must be based on consideration of any additional information required by the Director and the following factors:

- Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of ESA-listed species and designated critical habitat (e.g., prey base);
- Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;
- Land availability inasmuch as it relates to the feasibility of entrainment technology and remaining useful plant life; and
- Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.

The proposed determination in the fact sheet or statement of basis may be based on consideration of the following factors:

- Entrainment impacts on the waterbody;
- Thermal discharge impacts;
- Credit for unit retirements occurring within the past 10 years;
- Impacts on water consumption; and/or
- Availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water.

In implementing their responsibilities under the entrainment requirements, the Director is authorized to inspect the facility and to request additional information needed to determine permit conditions and requirements.

2.3.5 Monitoring and Reporting

At a minimum, the Director must require the permittee to monitor as required at § 125.94 (BTA standards compliance requirements for owners and operators), § 125.96 (monitoring requirements for owners and operators) and report as specified at §125.97 (reporting requirements for owners and operators). The Director shall determine monitoring requirements for entrainment on a site-specific basis. The Director may establish additional monitoring and reporting requirements, including monitoring and reporting requirements monitoring for federally-listed species. The Rule requires State Directors submit at least annually the results of such monitoring and reporting in facilities' annual reports, to the appropriate EPA Regional Office.

- EPA verified on April 8, 2014, that in circumstances where the Services have provided State Directors recommendations for control measures or monitoring and reporting requirements designed to minimize incidental take, reduce or remove more than minor detrimental effects to Federally-listed species and designated critical habitat, or avoid jeopardizing Federally-listed species or destroying or adversely modifying designated critical habitat, and the Services are concerned that without such control measures or monitoring and reporting requirements the permit may result in more than minor detrimental effects to federally-listed species or designated critical habitat, a State Director's failure to include these recommendations or requirements will subject the permit to EPA oversight provisions as outlined in the Preamble of the Rule, the April 8, 2014, correspondence from EPA, and in section 2.1 of this Opinion.

The Director may reduce monitoring requirements as follows:

- For new units at existing facilities, after 2 years following the initial permit issuance, the Director may approve a request for less frequent monitoring for impingement and entrainment in the remaining years of the permit term and when the permit is reissued.
- Where the facility's CWIS does not directly or indirectly affect federally-listed species or designated critical habitat, an owner or operator choosing the impingement mortality performance standard, may request the Director to reduce monitoring requirements after the first full permit term in which these monitoring requirements are implemented, on the condition that the results of the monitoring to date demonstrate that the owner or operator of the facility has consistently operated the intake as designed and is meeting the impingement mortality standard requirements.

2.3.6 Incidental Take

EPA requires the Director to include the following language as a permit condition: "Nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act."

2.3.7 Permit Notification

EPA requires the Director to transmit all permit applications received from existing facilities to

the appropriate Field Office of the U.S. Fish and Wildlife Service and/or Regional Office of the National Marine Fisheries Service upon receipt for a 60 day review prior to public notice of the draft or proposed permit. Directors may not propose/publish the draft permit until the 60 day Service review period has ended. Under current EPA NPDES regulations, Directors are also required to provide for public notice and a public comment period (40 CFR §§ 124.10 & 124.11) and to submit a copy of the fact sheet or statement of basis (prepared in the case of EPA-issued permits), the permit application (if any), and the draft permit (if any) to the Services. This includes notice of specific CWIS requirements and notice of the draft permit and any specific information the Director has about threatened or endangered species and critical habitat that are or may be present in the action area, including any proposed control measures and monitoring and reporting requirements for such species and habitat.

2.3.8 Permit Modification

As described in the Preamble, “the NPDES regulations also allow a Director to modify a permit during the term of the permit, consistent with the Federal regulations at 40 CFR sections 122.62, 122.63, 122.64, and 124.5. Among other things, under 40 CFR 122.62, causes for permit modification include new information, not available at the time of permit issuance, including information on newly listed threatened or endangered species or federally-designated critical habitat (or unanticipated impacts thereto) received that would have justified the application of different permit conditions at the time of issuance.”

3.0 Approach to the Assessment

Section 7(a)(2) requires every Federal agency, in consultation with and with the assistance of the Services, insure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any ESA-listed species or result in the destruction or adverse modification of critical habitat (16 U.S.C. 1539). During the consultation summarized by this Opinion, we reviewed all relevant information provided by EPA to describe the action, including interrelated and interdependent actions. Interrelated actions are part of a larger action and depend on the larger action for their justification. Interdependent actions have no independent utility apart from the proposed action (50 CFR 402.02). We also described the action area, which includes all areas affected directly or indirectly by the action (50 CFR 402.02) and evaluated the current status of ESA-listed and designated critical habitat that may be affected by this proposed action.

We evaluated the direct and indirect effects of the action on ESA-listed species and designated critical habitat. Indirect effects are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). We assessed the exposure to physical, chemical, or biotic stressors produced by the proposed action, whether such exposure is likely to reduce the survival and reproduction of individuals, and whether fitness reductions would threaten the viability of populations and species. We assessed whether the action would appreciably reduce the likelihood of recovery of listed species. We assessed whether the action is likely to reduce the conservation value of critical habitat. We did not rely on the regulatory definition of “destruction or adverse modification of critical habitat (50 CFR 402.02); instead, we relied upon the statutory provisions of the ESA to complete our critical habitat analysis. We also searched for data on cumulative effects of non-Federal activities (i.e., State and private) that are reasonably certain to occur within the action area. For all analyses, we used the best

available scientific and commercial data. For this consultation, we relied on information submitted by the action agency, government reports, and the general scientific literature.

We used the above process to formulate this Opinion. Because we are consulting on the issuance and implementation of a Federal Rule, which regulates many activities conducted over several geographic areas and long periods of time, there is substantial uncertainty about the number, location, timing, frequency, and intensity of individual activities. Therefore, we conducted a programmatic consultation to determine whether EPA's issuance and implementation of the Rule as described in the Description of the Proposed Action is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat.

4.0 Action Area

Under section 7 implementing regulations, action area is defined as “all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). As the effects of CWIS can extend well beyond the footprint of the structure, for purposes of this consultation, the action area consists of waters over which EPA has jurisdiction, see Section 502(7-10), 33 U.S.C. 1362(7-10), from which existing facilities withdraw water for cooling purposes (Figure 1).

Although not necessarily regulated by EPA, the action area also includes other wetland or aquatic sites that do not meet the definition of “Waters of the U.S.” and/or adjacent upland areas that may be affected by water intake associated with CWIS (i.e., impingement, entrainment, or other adverse effects caused by resultant environmental changes, including but not limited to loss of prey, changes in water quality, and flow alteration).

The location of all facilities that may be within the action area of the rule is unknown. From a survey that EPA conducted, however, EPA knows the names and location of 575 electric generating facilities and 230 manufacturers that may be within action area of the rule. The survey was a census of electric generating facilities. For manufacturers, however, a weighted sample was collected. For the purpose of analyzing the rule, EPA estimated that 544 electric generating facilities and 521 manufacturing facilities, or a total of 1,065 facilities, will be subject to the rule (ABT 2014).

While EPA is confident that in its estimate that there are 1,065 total facilities with one or more cooling water intake structures, because of the sample of manufacturers, EPA does not know the location of roughly 315 of these facilities (ABT 2014). Consequently, in order to produce a better sense of manufacturers' locations for the purpose of the biological evaluation, EPA developed an upper-bound set of manufacturers. This set included all manufacturers that may potentially be within the Agency's action area of the rule, found by searching its permit database for facilities that hold a NPDES permit and share a North American Industry Classification code with manufacturing facilities that responded to the survey that they had a CWIS. This search identified the location of an additional 2,925 manufacturing facilities that may be within action area of the rule. EPA added the 2,925 additional manufacturing facilities to the 575 electric generating facilities and 230 manufacturers with known locations to estimate that a total of 3,730 facilities may potentially be within the action area of the rule. It is important to note that EPA is

confident that only 1,065 of these 3,730 facilities have a cooling water intake structure (ABT 2014). Nonetheless the set of 3,730 facilities, which represents an upper bound estimate of the number of facilities that may possibly have cooling water intakes, allows the Services to identify the broadest set of ESA-listed species that may be affected CWISs.

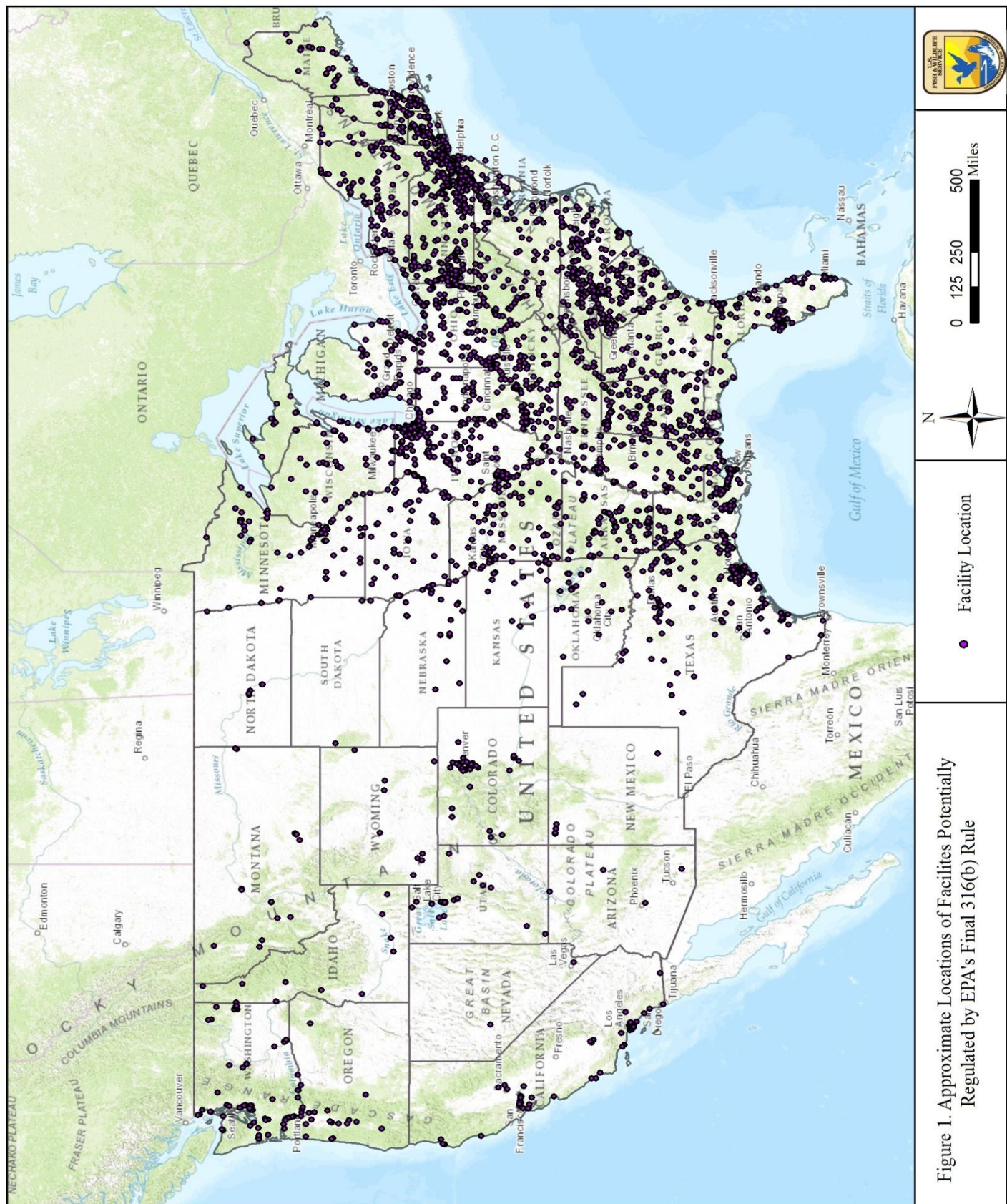


Figure 1. Approximate Locations of Facilities Potentially Regulated by EPA's Final 316(b) Rule

5.0 Status of the Species

In the biological evaluation, EPA identified 312 species that may be affected by the proposed Rule (Table 2-2 of biological evaluation). Table 2 represents a refinement of EPA's list of 312 to include only those species under the jurisdiction of the USFWS we believe may be affected by the proposed action (n=195). Table 3 includes those species distinct population segments, evolutionarily significant units, or subspecies under the jurisdiction of the NMFS we believe may be affected by the proposed action (n=71). We reach this conclusion based on the overlap between the species' habitats and facilities with CWISs, and/or the level of effect on the species from CWISs that may result in incidental take.

For more information regarding the individual species and critical habitats listed in Table 2, and the factors affecting their conservation status, please refer to proposed and final listing determinations, critical habitat designations, recovery plans, and five-year reviews available at: <http://ecos.fws.gov/ecos/indexPublic.do>. For more information regarding the individual species and critical habitats listed in Table 3 and the factors affecting their conservation status, please refer to Appendix B. The discussion that follows focuses on attributes of life history and distribution that influence the manner and likelihood that species may be exposed to the proposed action, as well as the species potential response and risk when exposure occurs.

Table 2. ESA-listed species and critical habitat that may be adversely affected by EPA's proposed 316(b) regulation under the jurisdiction of USFWS.

Common Name	Scientific Name	Status	Critical Habitat
Amphibians			
Ozark Hellbender	<i>Cryptobranchus alleganiensis</i>	Endangered	No*
Barton Springs Salamander	<i>Eurycea sosorum</i>	Endangered	Yes
California Red-Legged Frog	<i>Rana draytonii</i>	Threatened	Yes
Birds			
Hawaiian (=Koloa) Duck	<i>Anas wyvilliana</i>	Endangered	No*
Marbled Murrelet	<i>Brachyramphus marmoratus</i>	Threatened	No
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	Threatened	Yes
Piping Plover	<i>Charadrius melodus: Great Lakes</i>	Endangered	No
Piping Plover	<i>Charadrius melodus: Non-Great</i>	Threatened	No
Hawaiian Coot	<i>Fulica americana alai</i>	Endangered	No*
Hawaiian Common Moorhen	<i>Gallinula chloropus sandvicensis</i>	Endangered	No*
Whooping Crane	<i>Grus americana</i>	Endangered	Yes
Mississippi Sandhill Crane	<i>G. canadensis pulla</i>	Endangered	No
Hawaiian Stilt	<i>Himantopus mexicanus knudseni</i>	Endangered	No*
Wood Stork	<i>Mycteria americana</i>	Endangered	No*
Eskimo Curlew	<i>Numenius borealis</i>	Endangered	No*
Short-Tailed Albatross	<i>Phoebastria (=Diomedea) albatrus</i>	Endangered	No*
Steller's Eider	<i>Polysticta stelleri</i>	Threatened	No
Light-Footed Clapper Rail	<i>Rallus longirostris levipes</i>	Endangered	No*
California Clapper Rail	<i>R. longirostris obsoletus</i>	Endangered	No*
Yuma Clapper Rail	<i>R. l. yumanensis</i>	Endangered	No*

Common Name	Scientific Name	Status	Critical Habitat
Everglade Snail Kite	<i>Rostrhamus sociabilis plumbeus</i>	Endangered	No*
Least Tern	<i>Sterna antillarum</i>	Endangered	No*
California Least Tern	<i>S. antillarum browni</i>	Endangered	No*
Roseate Tern	<i>S. dougallii dougallii</i>	Threatened	No*
Bivalves			
Cumberland Elktoe	<i>Alasmidonta atropurpurea</i>	Endangered	No
Dwarf Wedgemussel	<i>A. heterodon</i>	Endangered	No*
Appalachian Elktoe	<i>A. raveneliana</i>	Endangered	No
Fat (Mussel) Three-Ridge	<i>Amblema neislerii</i>	Endangered	No
Ouachita Rock Pocketbook	<i>Arkansia wheeleri</i>	Endangered	No*
Spectaclecase (Mussel)	<i>Cumberlandia monodonta</i>	Endangered	No*
Fanshell	<i>Cyprogenia stegaria</i>	Endangered	No*
Dromedary Pearlymussel	<i>Dromus dromas</i>	Endangered	No*
Chipola Slabshell	<i>Elliptio chipolaensis</i>	Threatened	Yes
Altamaha Spiny mussel	<i>E. spinosa</i>	Endangered	No
Tar River Spiny mussel	<i>E. steinstansana</i>	Endangered	No*
Purple (Mussel) Bankclimber	<i>Elliptoideus sloatianus</i>	Threatened	No
Cumberlandian Combshell	<i>Epioblasma brevidens</i>	Endangered	Yes
Oyster Mussel	<i>E. capsaeformis</i>	Endangered	Yes
Curtis Pearlymussel	<i>E. florentina curtisii</i>	Endangered	No*
Yellow (Pearlymussel) Blossom	<i>E. f. florentina</i>	Endangered	No*
Tan Riffleshell	<i>E. f. walkeri (=E. walkeri)</i>	Endangered	No*
Upland Combshell	<i>E. metastrata</i>	Endangered	No
Purple Cat's Paw (=Purple Cat's Paw Pearlymussel)	<i>E. obliquata obliquata</i>	Endangered	No*
White (Pearlymussel) Catpaw	<i>E. o. perobliqua</i>	Endangered	No*
Southern Acornshell	<i>E. othcaloogensis</i>	Endangered	No
Southern Combshell	<i>E. penita</i>	Endangered	No*
Green (Pearlymussel) Blossom	<i>E. torulosa gubernaculum</i>	Endangered	No*
Northern Riffleshell	<i>E. t. rangiana</i>	Endangered	No*
Tubercled (Pearlymussel) Blossom	<i>E. t. torulosa</i>	Endangered	No*
Snuffbox Mussel	<i>E. triquetra</i>	Endangered	No*
Turgid (Pearlymussel) Blossom	<i>E. turgidula</i>	Endangered	No*
Tapered Pigtoe	<i>Fusconaia burkei</i>	Threatened	No
Shiny Pigtoe	<i>F. cor</i>	Endangered	No*
Finerayed Pigtoe	<i>F. cuneolus</i>	Endangered	No*
Narrow Pigtoe	<i>F. escambia</i>	Threatened	No
Round Ebonyshell	<i>F. rotulata</i>	Endangered	No
Cracking Pearlymussel	<i>Hemistena lata</i>	Endangered	No*
Pink (Pearlymussel) Mucket	<i>Lampsilis abrupta</i>	Endangered	No*
Finelined Pocketbook	<i>L. altalis</i>	Threatened	No
Higgins Eye (Pearlymussel)	<i>L. higginsii</i>	Endangered	No*
Orangenacre Mucket	<i>L. perovalis</i>	Threatened	Yes
Arkansas Fatmucket	<i>L. powellii</i>	Threatened	No*

Common Name	Scientific Name	Status	Critical Habitat
Shinyrayed Pocketbook	<i>L. subangulata</i>	Endangered	Yes
Speckled pocketbook	<i>L. streckeri</i>	Endangered	No*
Alabama Lampmussel	<i>L. virescens</i>	Endangered	No*
Carolina Heelsplitter	<i>Lasmigona decorata</i>	Threatened	No
Birdwing Pearlymussel	<i>Lemiox rimosus</i>	Endangered	No*
Scaleshell Mussel	<i>Leptodea leptodon</i>	Endangered	No*
Louisiana Pearlshell	<i>Margaritifera hembeli</i>	Threatened	No*
Alabama Pearlshell	<i>M. marrianae</i>	Endangered	No
Alabama Moccasinshell	<i>Medionidus acutissimus</i>	Threatened	No
Coosa Moccasinshell	<i>M. parvulus</i>	Endangered	No
Gulf Moccasinshell	<i>M. penicillatus</i>	Endangered	Yes
Ochlockonee Moccasinshell	<i>M. simpsonianus</i>	Endangered	Yes
Ring Pink (Mussel)	<i>Obovaria retusa</i>	Endangered	No*
Littlewing Pearlymussel	<i>Pegias fabula</i>	Endangered	No*
White (Pearlymussel) Wartyback	<i>Plethobasus cicatricosus</i>	Endangered	No*
Orangefoot (Pearlymussel) Pimpleback	<i>P. cooperianus</i>	Endangered	No*
Sheepnose Mussel	<i>P. cyphus</i>	Endangered	No*
Clubshell	<i>Pleurobema clava</i>	Endangered	No*
James Spinymussel	<i>P. collina</i>	Endangered	No*
Black Clubshell	<i>P. curtum</i>	Endangered	No*
Southern Clubshell	<i>P. decisum</i>	Endangered	Yes
Dark Pigtoe	<i>P. furvum</i>	Endangered	No
Southern Pigtoe	<i>P. georgianum</i>	Endangered	No
Cumberland Pigtoe	<i>P. gibberum</i>	Endangered	No*
Georgia Pigtoe	<i>P. hanleyianum</i>	Endangered	No
Flat Pigtoe	<i>P. marshalli</i>	Endangered	No*
Ovate Clubshell	<i>P. perovatum</i>	Endangered	No
Rough Pigtoe	<i>P. plenum</i>	Endangered	No*
Oval Pigtoe	<i>P. pyriforme</i>	Endangered	Yes
Fuzzy Pigtoe	<i>P. strodeanum</i>	Threatened	No
Heavy Pigtoe	<i>P. taitianum</i>	Endangered	No*
Fat Pocketbook	<i>Potamilus capax</i>	Endangered	No*
Alabama (=Inflated) Heelsplitter	<i>P. inflatus</i>	Threatened	No*
Triangular Kidneyshell	<i>Ptychobranthus greenii</i>	Endangered	No
Southern Kidneyshell	<i>P. jonesi</i>	Endangered	No
Rough Rabbitsfoot	<i>Quadrula cylindrica strigillata</i>	Endangered	Yes
Winged Mapleleaf	<i>Q. fragosa</i>	Endangered	No*
Cumberland (Pearlymussel) Monkeyface	<i>Q. intermedia</i>	Endangered	No*
Appalachian (Pearlymussel) Monkeyface	<i>Q. sparsa</i>	Endangered	No*
Stirrupshell	<i>Q. stapes</i>	Endangered	No*
Pale (Pearlymussel) Lilliput	<i>Toxolasma cylindrellus</i>	Endangered	No*
Choctaw Bean	<i>Villosa choctawensis</i>	Endangered	No*
Rayed Bean	<i>V. fabalis</i>	Endangered	No*

Common Name	Scientific Name	Status	Critical Habitat
Purple Bean	<i>V. perpurpurea</i>	Endangered	Yes
Cumberland (Pearlymussel) Bean	<i>V. trabalis</i>	Endangered	No*
Fish			
Gulf Sturgeon	<i>Acipenser oxyrinchus desotoi</i>	Threatened	Yes
White Sturgeon	<i>A. transmontanus</i>	Endangered	No
Santa Ana Sucker	<i>Catostomus santaanae</i>	Threatened	No
June Sucker	<i>Chasmistes liorus</i>	Endangered	No
Laurel Dace	<i>Chrosomus saylori</i>	Endangered	No
Blue Shiner	<i>Cyprinella caerulea</i>	Threatened	No*
Spotfin Chub	<i>Erimonax monachus</i>	Threatened	No
Slender Chub	<i>Erimystax cahni</i>	Threatened	No
Slackwater Darter	<i>Etheostoma boschungii</i>	Threatened	No
Relict Darter	<i>E. chienense</i>	Endangered	No*
Etowah Darter	<i>E. etowahae</i>	Endangered	No*
Niangua Darter	<i>E. nianguae</i>	Threatened	No
Duskytail Darter	<i>E. percnurum</i>	Endangered	No*
Rush Darter	<i>E. phytophilum</i>	Endangered	No
Bayou Darter	<i>E. rubrum</i>	Threatened	No*
Cherokee Darter	<i>E. scotti</i>	Threatened	No*
Maryland Darter	<i>E. sellare</i>	Endangered	No
Cumberland Darter	<i>E. susanae</i>	Endangered	No
Boulder Darter	<i>E. wapiti</i>	Endangered	No*
Tidewater Goby	<i>Eucyclogobius newberryi</i>	Endangered	No
Unarmored Threespine Stickleback	<i>Gasterosteus aculeatus williamsoni</i>	Endangered	No*
Hutton Tui Chub	<i>Gila bicolor</i> ssp.	Threatened	No*
Mohave Tui Chub	<i>G. b. ssp. mohavensis</i>	Endangered	No*
Humpback Chub	<i>G. cypha</i>	Endangered	No
Bonytail Chub	<i>G. elegans</i>	Endangered	No
Gila Chub	<i>G. intermedia</i>	Endangered	No
Virgin River Chub	<i>G. seminuda (=robusta)</i>	Endangered	No
Rio Grande Silvery Minnow	<i>Hybognathus amarus</i>	Endangered	No
Delta Smelt	<i>Hypomesus transpacificus</i>	Threatened	Yes
White River Spinedace	<i>Lepidomeda albivallis</i>	Endangered	No
Little Colorado Spinedace	<i>Lepidomeda vittata</i>	Threatened	No
Spikedace	<i>Meda fulgida</i>	Endangered	No
Waccamaw Silverside	<i>Menidia extensa</i>	Threatened	No
Palezone Shiner	<i>Notropis albizonatus</i>	Endangered	No*
Cahaba Shiner	<i>N. cahabae</i>	Endangered	No*
Arkansas River Shiner	<i>N. girardi</i>	Threatened	No
Cape Fear Shiner	<i>N. mekistocholas</i>	Endangered	No
Pecos Bluntnose Shiner	<i>N. simus pecosensis</i>	Threatened	No
Topeka Shiner	<i>N. topeka (=tristis)</i>	Endangered	No
Chucky Madtom	<i>N. crypticus</i>	Endangered	No

Common Name	Scientific Name	Status	Critical Habitat
Yellowfin Madtom	<i>N. flavipinnis</i>	Threatened	No
Neosho Madtom	<i>N. placidus</i>	Threatened	No*
Pygmy Madtom	<i>N. stanauli</i>	Endangered	No*
Scioto Madtom	<i>N. trautmani</i>	Endangered	No*
Greenback Cutthroat Trout	<i>O. clarki stomias</i>	Threatened	No*
Lahontan Cutthroat Trout	<i>O. clarkii henshawi</i>	Threatened	No*
Paiute cutthroat Trout	<i>O. clarkii seleniris</i>	Threatened	No*
Oregon Chub	<i>Oregonichthys crameri</i>	Threatened	No
Amber Darter	<i>Percina antesella</i>	Endangered	No
Goldline Darter	<i>P. aurolineata</i>	Threatened	No*
Conasauga Logperch	<i>P. jenkinsi</i>	Endangered	No
Leopard Darter	<i>P. pantherina</i>	Threatened	No
Roanoke Logperch	<i>P. rex</i>	Endangered	No*
Snail Darter	<i>P. tanasi</i>	Threatened	No*
Blackside Dace	<i>Phoxinus cumberlandensis</i>	Threatened	No*
Woundfin	<i>Plagopterus argentissimus</i>	Endangered	No
Gila (Incl. Yaqui) Topminnow	<i>Poeciliopsis occidentalis</i>	Endangered	No*
Colorado Pikeminnow (=Squawfish)	<i>Ptychocheilus lucius</i>	Endangered	No
Foskett Speckled Dace	<i>R. osculus ssp.</i>	Threatened	No*
Atlantic Salmon	<i>Salmo salar</i>	Endangered	No
Bull Trout	<i>Salvelinus confluentus</i>	Threatened	No
Pallid Sturgeon	<i>Scaphirhynchus albus</i>	Endangered	No*
Alabama Sturgeon	<i>Scaphirhynchus suttkusi</i>	Endangered	No
Loach Minnow	<i>Tiaroga cobitis</i>	Endangered	No
Razorback Sucker	<i>Xyrauchen texanus</i>	Endangered	Yes
Mammals			
Northern Sea Otter	<i>Enhydra lutris kenyoni</i>	Threatened	No
Southern Sea Otter	<i>E.l. nereis</i>	Threatened	No*
West Indian Manatee	<i>Trichechus manatus</i>	Endangered	Yes
Grizzly Bear	<i>Ursus arctos horribilis</i>	Threatened	No*
Reptiles			
American Crocodile	<i>Crocodylus acutus</i>	Threatened	No
Yellow-Blotched Map Turtle	<i>Graptemys flavimaculata</i>	Threatened	No*
Alabama Red-Belly Turtle	<i>Pseudemys alabamensis</i>	Endangered	No*
Snails			
Pecos Assiminea Snail	<i>Assiminea pecos</i>	Endangered	No
Anthony's Riversnail	<i>Atheurnia anthonyi</i>	Endangered	No*
Slender Campeloma	<i>Campeloma decampi</i>	Endangered	No*
Lacy (Snail) Elimia	<i>Elimia crenatella</i>	Threatened	No*
Koster's Springsnail	<i>Juturnia kosteri</i>	Endangered	No
Round Rocksnail	<i>Leptoxis ampla</i>	Threatened	No*
Interrupted (=Georgia) Rocksnail	<i>Leptoxis foremani</i>	Endangered	No
Plicate Rocksnail	<i>Leptoxis plicata</i>	Endangered	No*

Common Name	Scientific Name	Status	Critical Habitat
Painted Rocksnail	<i>Leptoxis taeniata</i>	Threatened	No*
Flat Pebblesnail	<i>Lepyrium showalteri</i>	Endangered	No*
Cylindrical (Snail) Lioplax	<i>Lioplax cyclostomaformis</i>	Endangered	No*
Snake River Physa Snail	<i>Physa natricina</i>	Endangered	No*
Rough Hornsnail	<i>Pleurocera foremani</i>	Endangered	Yes
Bliss Rapids Snail	<i>Taylorconcha serpenticola</i>	Threatened	No*
Tulotoma Snail	<i>Tulotoma magnifica</i>	Threatened	No*

*Critical habitat has not been designated for these species.

Table 3. ESA-listed species and critical habitat that may be adversely affected by EPA's proposed 316(b) regulation under the jurisdiction of NMFS.

Common name (Distinct population segment, evolutionarily significant unit, or subspecies)	Scientific name	Status	Critical habitat
Cetaceans			
Blue whale	<i>Balaenoptera musculus</i>	Endangered	No
Bowhead whale	<i>Balaena mysticetes</i>	Endangered	No
Fin whale	<i>Balaenoptera physalus</i>	Endangered	No
Humpback whale	<i>Megaptera novaeangliae</i>	Endangered	No
Killer whale (Southern Resident*)	<i>Orcinus orca</i>	Endangered	Yes
North Atlantic right whale*	<i>Eubalaena glacialis</i>	Endangered	Yes
Sei whale	<i>Balaenoptera borealis</i>	Endangered	No
Sperm whale	<i>Physeter macrocephalus</i>	Endangered	No
Beluga whale (Cook Inlet)*	<i>Delphinapterus leucas</i>	Endangered	Yes
False killer whale (Main Hawaiian Island insular)	<i>Pseudorca crassidens</i>	Endangered	No
Pinnipeds			
Guadalupe fur seal	<i>Arctocephalus townsendi</i>	Threatened	No
Hawaiian monk seal*,**	<i>Monachus schauinslandi</i>	Endangered	Yes, Proposed
Steller sea lion (Western*)	<i>Eumetopias jubatus</i>	Endangered	Yes
Bearded seal (Beringia)	<i>Erignathus barbatus nauticus</i>	Threatened	No
Ringed seal (Arctic)	<i>Phoca hispida hispida</i>	Threatened	No
Sea turtles			
Green sea turtle (Florida & Mexico's Pacific coast colonies)	<i>Chelonia mydas</i>	Endangered	No
Green sea turtle (all other areas*)		Threatened	Yes
Hawksbill sea turtle*	<i>Eretmochelys imbricate</i>	Endangered	Yes
Kemp's ridley sea turtle	<i>Lepidochelys kempii</i>	Endangered	No
Leatherback sea turtle*	<i>Dermochelys coriacea</i>	Endangered	Yes
Loggerhead sea turtle (North Pacific Ocean)	<i>Caretta caretta</i>	Endangered	No
Loggerhead sea turtle (Northwest Atlantic Ocean**)		Threatened	Proposed
Olive ridley sea turtle (Mexico's Pacific coast breeding colonies)	<i>Lepidochelys olivacea</i>	Endangered	No
Olive ridley sea turtle (all other areas)		Threatened	No
Sturgeons			
Shortnose sturgeon	<i>Acipenser brevirostrum</i>	Endangered	No

Common name (Distinct population segment, evolutionarily significant unit, or subspecies)	Scientific name	Status	Critical habitat
Green sturgeon (southern*)	<i>Acipenser medirostris</i>	Threatened	Yes
Gulf sturgeon*	<i>Acipenser oxyrhynchus desotoi</i>	Threatened	No
Atlantic sturgeon (Gulf of Maine)	<i>Acipenser oxyrhynchus</i>	Threatened	No
Atlantic sturgeon (New York Bight)		Endangered	No
Atlantic sturgeon (Chesapeake Bay)		Endangered	No
Atlantic sturgeon (Carolina)		Endangered	No
Atlantic sturgeon (South Atlantic)		Endangered	No
Salmonids			
Atlantic salmon (Gulf of Maine*)	<i>Salmo salar</i>	Endangered	Yes
Chinook salmon (CA Coastal*)	<i>Oncorhynchus tshawytscha</i>	Threatened	Yes
Chinook salmon (Central Valley Spring-run*)		Threatened	Yes
Chinook salmon (Lower Columbia River*)		Threatened	Yes
Chinook salmon (Upper Columbia River Spring-run*)		Endangered	Yes
Chinook salmon (Puget Sound*)		Threatened	Yes
Chinook salmon (Sacramento River Winter-run*)		Endangered	Yes
Chinook salmon (Snake River Fall-run*)		Threatened	Yes
Chinook salmon (Snake River Spring/Summer-run*)		Threatened	Yes
Chinook salmon (Upper Willamette River*)		Threatened	Yes
Chum salmon (Columbia River*)	<i>Oncorhynchus keta</i>	Threatened	Yes
Chum salmon (Hood Canal Summer-run*)		Threatened	Yes
Coho salmon (Central CA Coast*)	<i>Oncorhynchus kisutch</i>	Endangered	Yes
Coho salmon (Lower Columbia River**)		Threatened	Proposed
Coho salmon (Southern Oregon & Northern California Coast*)		Threatened	Yes
Coho salmon (Oregon Coast*)			Yes
Sockeye salmon (Ozette Lake*)	<i>Oncorhynchus nerka</i>	Threatened	Yes
Sockeye salmon (Snake River*)		Endangered	Yes
Steelhead (Central California Coast*)	<i>Oncorhynchus mykiss</i>	Threatened	Yes
Steelhead (California Central Valley*)		Threatened	Yes
Steelhead (Lower Columbia River*)		Threatened	Yes
Steelhead (Middle Columbia River*)		Threatened	Yes
Steelhead (Northern California*)		Threatened	Yes
Steelhead (Puget Sound)		Threatened	No
Steelhead (Snake River*)		Threatened	Yes
Steelhead (South-Central California Coast*)		Threatened	Yes
Steelhead (Southern California*)		Threatened	Yes
Steelhead (Upper Columbia River*)		Threatened	Yes
Steelhead (Upper Willamette River*)		Threatened	Yes
Other fishes			
Pacific eulachon*	<i>Thaleichthys pacificus</i>	Threatened	Yes
Bocaccio (Georgia Basin**)	<i>Sebastes paucispinis</i>	Endangered	Proposed
Yelloweye rockfish (Georgia Basin**)	<i>Sebastes pinniger</i>	Threatened	Proposed

Common name (Distinct population segment, evolutionarily significant unit, or subspecies)	Scientific name	Status	Critical habitat
Canary rockfish (Georgia Basin**)	<i>Sebastes ruberrimus</i>	Threatened	Proposed
Smalltooth sawfish*	<i>Pristis pectinata</i>	Endangered	Yes
Marine invertebrates			
Elkhorn coral*	<i>Acropora palmata</i>	Threatened ³	Yes
Staghorn coral*	<i>Acropora cervicornis</i>	Threatened ¹	Yes
White abalone	<i>Haliotis sorenseni</i>	Endangered	
Black abalone*	<i>Haliotis cracherodii</i>	Endangered	Yes
Marine plants			
Johnson's seagrass*	<i>Halophila johnsonii</i>	Threatened	Yes

6.0 Environmental Baseline

The Environmental Baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of State or private actions, which are contemporaneous with the consultation in process (50 CFR 402.02). The key purpose of the Environmental Baseline is to describe the condition of the listed species/critical habitat that exist in the action area in the absence of the action subject to consultation. This Environmental Baseline focuses primarily on the status and trends of the aquatic ecosystems in the United States and the consequences of that status for listed resources.

Consistent with case law, we include in the Environmental Baseline the existence of CWIS at existing facilities, but not their operation. We acknowledge that facilities with CWIS exist, and that those facilities impinge and entrain aquatic organisms on a daily basis. However, the operation of those CWIS is within EPA's discretion. Therefore, for this baseline, we assume the CWIS are in place, but are not in operation. In *re Operation of Missouri River System Litigation*, 421 F.3d. 618 (8th Cir. 2005), the Eighth Circuit upheld the Service's use of a 'run of the river' baseline, "in which the dams and physical channel modifications are assumed to be in place, but all floodgates are assumed to be wide open, with no flood control, "...the hypothetical continued operation [sic] (of the dams) under the previous version of the Master Manual in future years, as the alternative to the proposed action of updating the Master Manual, does not in any sense constitute a "past impact" of federal action." The Ninth Circuit reached a similar conclusion in *National Wildlife Federation v. NMFS*: "Although we acknowledge that the existence of the dams must be included in the environmental baseline, the operation of dams is within the federal agencies' discretion under both the ESA and the Northwest Power Act, 16 U.S.C. §839." 524 F.3d 917 (9th Cir.2008): Using the same logic, the continued operation of CWIS does not constitute a past impact of Federal action and is not included in the environmental baseline.

All of the endangered and threatened species and designated critical habitat considered in this Opinion depend on the health of aquatic ecosystems for their survival. These species were listed

³ Proposed endangered

as endangered or threatened, at least in part, because of the consequences of human activities on the aquatic ecosystems to include estuaries, rivers, lakes, streams, and associated wetlands, floodplains, and riparian ecosystems of the United States, its Territories and possessions. The status and trends of those aquatic ecosystems determines the status and trends of these species and the critical habitat that has been designated for them.

Habitat

Freshwater habitats are among the most threatened ecosystems in the world (Leidy and Moyle 1998). Reviews of aquatic species' conservation status over the past three decades have documented the cumulative effect of anthropogenic and natural stressors on freshwater aquatic ecosystems, resulting in a significant decline in the biodiversity and condition of indigenous fish, mussel and crayfish communities (Taylor et al. 2007; Jelks et al. 2008). Anthropogenic stressors are present to some degree in all water bodies of the United States, and are the result of many different impacts. These stressors often lead to long-term environmental degradation associated with lowered biodiversity, reduced primary and secondary production, and a lowered capacity or resiliency of the ecosystem to recover to its original state in response to natural perturbations (Rapport and Whitford 1999).

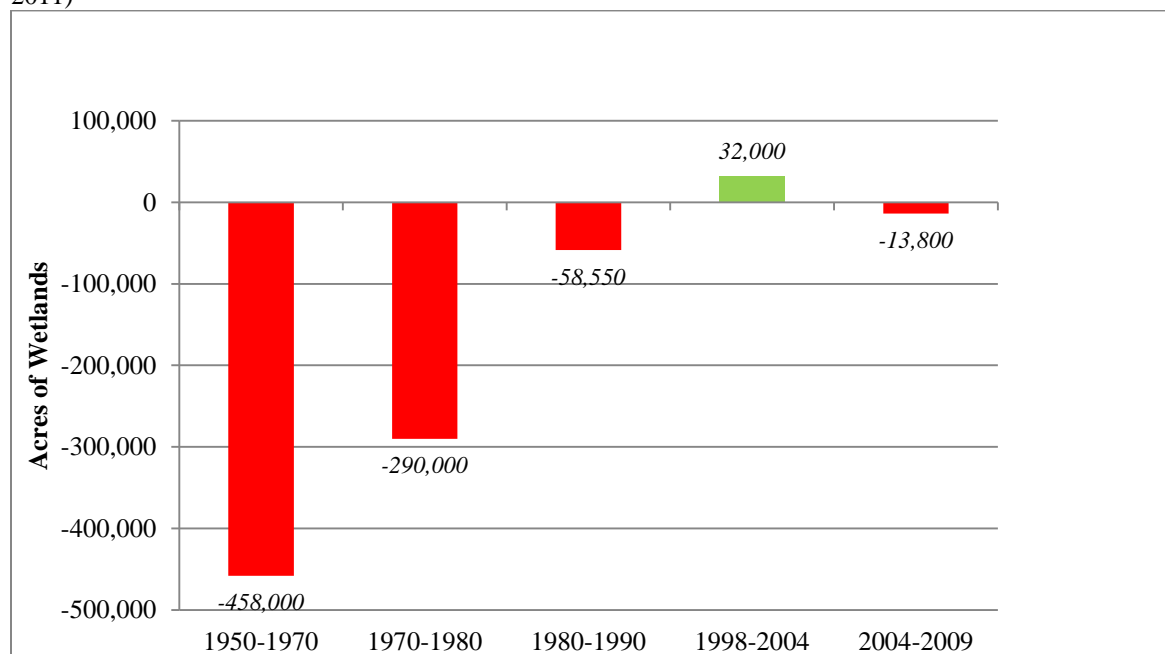
Many of our nation's rivers and streams have been altered by dams, stream channelization, and dredging to stabilize water levels in rivers or lakes. When examining the impacts of large dams alone, it is estimated that 75,000 large dams have modified at least 600,000 miles of rivers across the country (IWSRCC 2011). For example, more than 400 dams exist in the Columbia River Basin alone (Columbia Basin Trust 2014). Habitat loss coupled with other stressors has led to impacts on fish communities as well. By the early 80's, approximately 81 percent of the native fish communities in the United States had been adversely affected by human activities (Judy et al. 1984).

Wetland habitats have been drained to make land available for agriculture; they have been filled to make land available for residential housing, commerce, and industry; they have been diked to control mosquitoes; and they have been flooded for water supply. Efforts to create and restore wetlands and other aquatic habitats by agencies of Federal, State, and local governments, non-governmental organizations, and private individuals have dramatically reduced the rate at which these ecosystems have been destroyed or degraded, but many aquatic habitats continue to be lost each year. Between 2006 and 2009, approximately 13,800 acres of wetlands were lost per year (Dahl 2011). While this is significantly less than losses experienced in the previous decades (Figure 2), an estimated 72 percent of U.S wetlands have already been lost when compared to historical estimates (Dahl 2011).

Estuaries are some of the most productive ecosystems in the world. Thousands of species of birds, mammals, fish, and other wildlife depend on estuarine habitats as places to live, feed, and reproduce. Many marine organisms, including most commercially-important species of fish, depend on estuaries at some point during their development. Estuaries are important nursery and rearing habitat for fishes such as salmon and sturgeon, sea turtles, and many other species. For example, in estuaries that support salmon, changes in habitat and food-web dynamics have altered their capacity to support juvenile salmon (Bottom *et al.* 2005, Fresh *et al.* 2005, NMFS 2006d, LCFRB 2010). Diking and filling activities have reduced the tidal prism and eliminated

emergent and forested wetlands and floodplain habitats. These changes likely have reduced these estuary's' salmon-rearing capacity. Restoration of estuarine habitats, particularly diked emergent and forested wetlands, reduction of avian predation by terns, and flow manipulations to restore historical flow patterns may have begun to enhance the estuary's productive capacity for salmon, although historical changes in population structure and salmon life histories may prevent salmon from making full use of the productive capacity of estuarine habitats.

Figure 2. Average annual net wetland acreage loss and gain estimates for the conterminous U.S. (Taken from Dahl 2011)



Pollution

In addition to direct loss and alteration of aquatic habitat, many aquatic ecosystems have been impacted by various contaminants and pollutants. In 2008, the Heinz Center for Science, Economics and the Environment (Heinz Center) published a comprehensive report on the condition of our nation's ecosystems. In their report, the Heinz Center noted the following:

- From 1992 to 2001, benchmarks for the protection of aquatic life were exceeded in 50 percent of streams tested nationwide—83 percent of streams in urbanized areas—and 94 percent of streambed sediments.
- Contaminants were detected in approximately 80 percent of sampled freshwater fish and most of these detected contaminants exceeded wildlife benchmarks (1992–2001 data) (Gilliom et al 2006)
- Nearly all saltwater fish tested had at least five contaminants at detectable levels, and concentrations exceeded benchmarks for the protection of human health in one-third of fish tissue samples—most commonly DDT, PCBs, PAHs, and mercury (USEPA 2007.)

Toxic contaminants, as noted above have, been documented in the Lower Columbia River and its tributaries (LCREP 2007). More than 41,000 waters are listed as impaired by pollutants that include mercury, pathogens, sediment, other metals, nutrient, and oxygen depletion, and other causes (USEPA 2013a). Pennsylvania reported the greatest number of impaired waters (6,957),

followed by Washington (2,420), Michigan (2,352), and Florida (2,292). These figures likely underestimate the true number of impaired waterbodies in the U.S. For example, EPA's National Aquatic Resource Surveys (NARS) is a probability based survey that provides a national assessment of the nation's waters and is used to track changes in water quality over time. Through this method, EPA estimates that 50 percent of the nation's streams (approximately 300,000 miles) and 45 percent of the nation's lakes (approximately seven million acres) are in fair to poor condition for nitrogen or phosphorus levels relative to reference condition waters (USEPA 2013b). However, data submitted by the States indicates that only about half of the NARS estimate (155,000 miles of rivers and streams and about four million acres of lakes) have been identified on EPA's 303(d) impaired waters list for nutrient related causes (USEPA 2013b).

Water quality problems, particularly the problem of non-point sources of pollution, have resulted from changes humans have imposed on the landscapes of the United States over the past 100 to 200 years. The mosaic of land uses associated with urban and suburban centers has been cited as the primary cause of declining environmental conditions in the United States (Flather et al. 1998) and other areas of the world (Houghton 1994). Most land areas covered by natural vegetation are highly porous and have very little sheet flow; precipitation falling on these landscapes infiltrates the soil, is transpired by the vegetative cover or evaporates. The increased transformation of the landscapes of the United States into a mosaic of urban and suburban land uses has increased the area of impervious surfaces such as roads, rooftops, parking lots, driveways, sidewalks, etc., in those landscapes. Precipitation that would normally infiltrate soils in forests, grasslands and wetlands falls on and flows over impervious surfaces. That runoff is then channeled into storm sewers and released directly into surface waters (rivers and streams), which changes the magnitude and variability of water velocity and volume in those receiving waters.

Increases in polluted runoff have been linked to a loss of aquatic species diversity and abundance, including many important commercial and recreational fish species. Nonpoint source pollution has also contributed to coral reef degradation, fish kills, seagrass bed declines and algal blooms (including toxic algae) (NOAA 2013). In addition, many shellfish bed and swimming beach closures can be attributed to polluted runoff. As discussed in EPA's latest National Coastal Condition Report (NCCR), nonpoint sources have been identified as one of the stressors contributing to coastal water pollution (USEPA 2012). Since 2001, EPA has periodically released these reports detailing condition of the nation's coastal bays and estuaries and assessing trends in water quality in coastal areas. The latest NCCR report indicates that coastal water conditions have remained "fair" and the trend assessment demonstrates no significant change in the water quality of U.S. coastal waters since the publication of the NCCR II in 2004 (USEPA 2012).

In many estuaries, agricultural activities are major source of nutrients to the estuary and a contributor to the harmful algal blooms in summer, although according to McMahon and Woodside 1997 (EPA 2006a) nearly one-third of the total nitrogen inputs and one-fourth of the total phosphorus input to the estuary are from atmospheric sources. The National Estuary Program Condition Report found that nationally, 37% of national estuary program estuaries are in poor condition (<http://water.epa.gov/type/oceb/nep/nepccr-factsheet.cfm>).

Throughout the 20th century, mining, agriculture, paper and pulp mills, and municipalities contributed large quantities of pollutants to many estuaries. For example, the Roanoke River and the Albemarle-Pamlico Estuarine Complex which receives water from 43 counties in North Carolina and 38 counties and cities in Virginia. This estuarine system supports an array of ecological and economic functions that are of regional and national importance. Both the lands and waters of the estuarine system support rich natural resources that are intertwined with regional industries including forestry, agriculture, commercial and recreational fishing, tourism, mining, energy development, and others. The critical importance of sustaining the estuarine system was reflected in its Congressional designation as an estuary of national significance in 1987. Even so, today the Albemarle-Pamlico Estuarine Complex is rated in good to fair condition in the National Estuary Program Coastal Condition Report despite that over the past 40-year period data indicate some noticeable changes in the estuary, including increased dissolved oxygen levels, increased pH, decreased levels of suspended solids, and increased chlorophyll *a* levels (EPA 2006b).

Since 1993 EPA has compiled information on locally issued fish advisories and safe eating guidelines. This information is provided to the public to limit or avoid eating certain fish due to contamination of chemical pollutants. EPA's 2010 National Listing of Fish Advisories database indicates that 98 percent of the advisories are due (in order of importance) to: mercury, PCBs, chlordane, dioxins, and DDT (USEPA 2010). Fish advisories have been issued for 36 percent of the total river miles (approximately 1.3 million river miles) and 100 percent of the Great Lakes and connecting waterways (USEPA 2010). Fish advisories have been steadily increasing over the National Listing of Fish Advisories period of record (1993-2010), but EPA interprets these increases to reflect the increase in the number of waterbodies being monitored by States and advances in analytical methods rather than an increase in levels of problematic chemicals (USEPA 2010).

Water-quality concerns related to urban development include providing adequate sewage treatment and disposal, transport of contaminants to streams by storm runoff, and preservation of stream corridors. Water availability has been and will continue to be a major, long-term issue in many areas. It is now widely recognized that ground-water withdrawals can deplete streamflows (Morgan and Jones 1999), and one of the increasing demands for surface water is the need to maintain instream flows for fish and other aquatic biota.

Climate Change

All species discussed in this Opinion are or will be threatened by the direct and indirect effects of global climatic change. Climate change is projected to have substantial direct and indirect effects on individuals, populations, species, and the structure and function of marine ecosystems in the near future (IPCC 2002). The Intergovernmental Panel on Climate Change (IPCC) estimated that average global land and sea surface temperature has increased by 0.85°C (\pm 0.2) since the late-1800s, with most of the change occurring since the mid-1900s (IPCC 2013). This temperature increase is greater than what would be expected given the range of natural climatic variability recorded over the past 1,000 years (Crowley and Berner 2001). The IPCC estimates that the last 30 years were likely the warmest 30-year period of the last 1,400 years, and that global mean surface temperature change will likely increase in the range of 0.3 to 0.7°C over the next 20 years.

Warming water temperatures attributed to climate change can have significant effects on survival, reproduction, and growth rates of aquatic organisms (Staudinger et al 2012). For example, warmer water temperatures have been identified as a factor in the decline and disappearance of mussel and barnacle beds in the Northwest (Harley 2011). Shifts in migration timing of pink salmon (*Oncorhynchus gorbuscha*) which may lead to high pre-spawning mortality have also been tied to warmer water temperatures (Taylor 2008). Increasing atmospheric temperatures have already contributed to changes in the quality of freshwater, coastal, and marine ecosystems and have contributed to the decline of populations of endangered and threatened species (Karl et al. 2009; Littell et al. 2009; Mantua et al. 1997). Ocean acidification, as a result of increased atmospheric carbon dioxide, can interfere with numerous biological processes in corals including: fertilization, larval development, settlement success, and secretion of skeletons (Albright et al. 2010).

Climate change is also expected to impact the timing and intensity of stream seasonal flows (Staudinger et al 2012). Warmer temperatures are expected to reduce snow accumulation and increase stream flows during the winter, cause spring snowmelt to occur earlier in the year, and reduced summer stream flows in rivers that depend on snow melt. As a result, seasonal stream flow timing will likely shift significantly in sensitive watersheds (Littell et al. 2009). Warmer temperatures may also have the effect of increasing water use in agriculture, both for existing fields and the establishment of new ones in once unprofitable areas (ISAB 2007). This means that streams, rivers, and lakes will experience additional withdrawal of water for irrigation and increasing contaminant loads from returning effluent. Changes in stream flow due to use changes and seasonal run-off patterns may alter predator-prey interactions and change species assemblages in aquatic habitats. For example, a study conducted in an Arizona stream documented the complete loss of some macroinvertebrate species as the duration of low stream flows increased (Sponseller et al 2010). As it is likely that intensity and frequency of droughts will increase across the southwest (Karl et al. 2009), similar changes in aquatic species composition in the region is likely to occur.

Warmer water also stimulates biological processes which can lead to environmental hypoxia. Oxygen depletion in aquatic ecosystems can result in anaerobic metabolism increasing, thus leading to an increase in metals and other pollutants being released into the water column (Staudinger et al 2012). In addition to these changes, climate change may affect agriculture and other land development as rainfall and temperature patterns shift. Aquatic nuisance species invasions are also likely to change over time, as oceans warm and ecosystems become less resilient to disturbances (USEPA 2008). If water temperatures warm in marine ecosystems, native species may shift poleward to cooler habitats, opening ecological niches that can be occupied by invasive species introduced via ships' ballast water or other sources (Ruiz et al. 1999, Philippart et al. 2011). Invasive species that are better adapted to warmer water temperatures would outcompete native species that are physiologically geared towards lower water temperatures; such a situation currently occurs along central and northern California (Lockwood and Somero 2011)

In summary, the direct effects of climate change include increases in atmospheric temperatures, decreases in sea ice, and changes in sea surface temperatures, patterns of precipitation, and sea level. Indirect effects of climate change include altered reproductive seasons/locations, shifts in

migration patterns, reduced distribution and abundance of prey, and changes in the abundance of competitors and/or predators. Climate change is most likely to have its most pronounced effects on species whose populations are already in tenuous positions (Isaac 2008).

Clean Water Act

Several laws and regulations have been put in place to help improve the state of our aquatic resources, the principal one being the CWA. The original 1948 statute was totally re-written in 1972 to produce its current purpose: “to restore and maintain the chemical, physical, and biological integrity of the Nation's waters” (Federal Water Pollution Control Act, Public Law 92–500). Congress made substantial amendment to the CWA in the Water Quality Act of 1987 (P. L. 100-4) in response to the significant and persistent water quality problems.

To achieve its objectives, the CWA generally prohibits all point source discharges into the nation's waters, unless otherwise authorized under the CWA. One of the main ways that point source discharges are regulated is through permits issued under the NPDES authorized under the CWA. For example, the NPDES program regulates discharges of pollutants like bacteria, oxygen-consuming materials, and toxic pollutants like heavy metals, pesticides, and other organic chemicals. EPA has also promulgated regulations setting effluent limitations guidelines and standards under sections 301, 304, and 306 of the CWA for more than 50 industries [40 CFR parts 405 through 471]. These effluent limitations guidelines and standards for categories of industrial dischargers are based on pollutants of concern discharged by industry; the degree of control that can be attained using pollution control technology; consideration of various economic tests appropriate to each level of control; and other factors identified in sections 304 and 306 of the CWA (such as non-water quality environmental impacts including energy impacts) (F76 FR 22174-22288). These effluent limitations have been credited for helping reduce the amount of pollutants like toxic metals entering the aquatic environment (Smail et al 2012). While provisions of the CWA have helped significantly improve the quality of aquatic ecosystems, nonpoint sources of water pollution, which are believed to be responsible for the majority of modern water quality problems in the United States, are not subject to CWA permits or regulatory requirements. Instead, nonpoint sources of pollution are regulated by programs overseen by the States.

Water quality is important to all of the listed resources identified above in Tables 2 and 3. In some cases, the deterioration of water quality has led to the endangerment of aquatic species; in all cases, activities that threaten water quality also threaten these listed resources. Endangered and threatened species have experienced population declines that leave them vulnerable to a multitude of threats. Because of reduced abundance, low or highly variable growth capacity, and the loss of essential habitat, these species are less resilient to additional disturbances. In larger populations, stressors that affect only a limited number of individuals could once be tolerated by the species without resulting in population level impacts, whereas in smaller populations, the same stressors are more likely to reduce the likelihood of survival. It is with this understanding of the environmental baseline that we consider the effects of the proposed action, including the likely effect that CWIS's will have on endangered and threatened species and their designated critical habitat.

7.0 Effects of the Action

The effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur. Therefore, the issuance of State NPDES permits and any ensuing adverse effects to ESA-listed species or critical habitat caused by operation of CWISs is considered to be an indirect effect of EPA's 316(b) Rule promulgation.

In determining whether an action is likely to jeopardize listed species, the Services consider the effects of the action are in conjunction with the environmental baseline. The Services understand the effects of this action to include the operation of any facility with a CWIS that is permitted, either by EPA or by State or Tribal permitting authorities, pursuant to this regulation. We recognize the Rule may result in a net reduction of aquatic organisms lost to impingement and entrainment when compared to what has occurred historically. However, our analysis of effects is based, in part, on the assumption that all covered facilities must comply with the Rule or cease CWIS operations. As such, analysis of the effects of this action includes an evaluation of the full extent of impacts to listed species that will occur when facilities operate pursuant to the Rule, rather than an evaluation of the expected net decline versus current operations.

Pursuant to section 7(a)(2) of the ESA, Federal agencies are required to insure their actions are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat. Using the best available scientific and commercial information, we describe in this section: the potential physical, chemical, or biotic stressors associated with the proposed actions; the probability of individuals of listed species being exposed to these stressors; and the probable responses of those individuals (given exposure). If responses are likely to reduce an individual's fitness (i.e., growth, survival, annual reproductive success, and lifetime reproductive success), we evaluate the risk posed to the viability of the individuals' population, and ultimately of the species. The ultimate purpose of this assessment is to determine whether the proposed action is expected to reduce the species' likelihood of survival and recovery in the wild.

Our "destruction or adverse modification" determinations must be based on an action's effects on the conservation value of habitat that has been designated as critical to threatened or endangered species. If an area encompassed in a critical habitat designation is likely to be exposed to the direct or indirect effects of the proposed action on the natural environment, we ask if primary constituent elements included in the designation (if there are any) or physical, chemical or biotic components that give the designated area conservation value are likely to respond to that exposure.

7.1 Programmatic Approach

As noted, the scope of the 316(b) Rule is nationwide covering an array of facilities that may

affect a wide variety of listed species. The specific State CWA NPDES programs differ in regulatory approaches and the individual facilities vary in their size, scope, control technology, and operation. It is also uncertain which facilities may ultimately apply for CWA 316(b) permits. Under these circumstances, it is not feasible to conduct a meaningful site specific and species specific effects analysis, nor is such analysis required given the programmatic nature of the Rule and the fact that the Rule is not self-effecting (i.e. it is implemented only through future permits). Rather, the Services determined that a programmatic consultation is appropriate to address the regulatory process as it is outlined in the Rule and supporting documentation. The 316(b) Rule outlines the process and responsibilities for both facility owners and State Directors and those measures that will be implemented in the future. In our Programmatic approach, we examine whether and to what degree EPA has structured their 316(b) Rule to ensure that implementation of the final Rule is not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of critical habitat. In this evaluation, we assess whether EPA has structured the Rule and supporting documentation to enable EPA to fulfill the following criteria: (1) understand the scope of its action; (2) reliably estimate the physical, chemical, or biotic stressors that are likely to be produced as a direct or indirect result of their action; (3) minimize adverse effects of such activities on ESA-listed species and designated critical habitat; (4) identify, inform, encourage, and screen applicants for potential eligibility under or participation in the permitting activity; (5) continuously monitor and evaluate likely adverse effects on listed species and critical habitat; (6) monitor and enforce permit compliance; and (7) modify its action if new information (including inadequate protection for species or low levels of compliance) becomes available.

We assess EPA's compliance with the provisions of section 7(a)(2) of the ESA by evaluating the extent to which the Rule and supporting documentation establishes processes to require EPA, the owner or operator, and the Director, to collectively implement the provisions of section 316(b) of the CWA in a manner that ensures effects to ESA-listed species and critical habitat will be minimized and thereby avoid likely jeopardy and likely destruction or adverse modification of critical habitat, consistent with section 7(a)(2) of the ESA. Therefore, we focus primarily on the required aspects of the Rule and EPA's commitment to overseeing the implementation of the Rule when considering whether EPA has fulfilled its responsibilities under section 7(a)(2) of the ESA.

Key Assumptions for the Effects Analysis

In developing this analysis, we needed to make a number of key assumptions due to the lack of information and uncertainties surrounding the location, timing, frequency, and intensity of CWIS activities. If these assumptions prove incorrect or warrant changes during implementation of the Rule, it could affect the validity of this analysis and trigger re-initiation of ESA section 7 consultation if it results in effects that were not considered herein. When EPA is the NPDES permitting authority, EPA will consult on all NPDES permits it issues. Where EPA is not the permitting authority, the Rule requires Directors to provide the Services copies of all permit applications for review and comment, and to include in the record for the draft permit any species protection measures that the Services recommend. In addition, Directors must provide the Services with copies of all draft permits. We view this exchange of information and any resulting coordination as falling within the broad scope of "technical assistance" as described in

the Services' Consultation Handbook. Accordingly, we use the phrase technical assistance to describe the exchange of information between Directors and the Services as required in the Rule.

The following assumptions were used in completing this analysis:

- The Services will receive all permit applications upon receipt by the Director for a 60 day review prior to publication of a draft permit as required per the Rule.
- The Services anticipate that where necessary, State and Tribal Directors will incorporate the control measures, monitoring, and reporting recommendations provided by the Services through technical assistance facilitated by the exchange of information between the Directors and the Services into NPDES permits that contain 316(b) requirements.
- The control measures, monitoring, and reporting developed by the Services through technical assistance with the Directors will minimize the adverse effects of CWIS to levels that will avoid jeopardy to species and/or destruction and adverse modification of critical habitat.
- In the case of State permits that have been administratively continued, if the Services or EPA identify a permitted action by a facility that meets the eligibility requirements of the rule which is likely to have more than a minor detrimental effect on Federally-listed species or critical habitat, then the Services or EPA will contact the State to seek to remedy the situation (for instance by requesting new information from the facility when necessary). EPA will provide support and assistance to the Services in working with the State or Tribe. EPA and States have no authority to require changes to an expired, administratively continued permit. Instead, Directors have authority to issue a new permit. Therefore, EPA or the Services could request that the State issue a new permit. *See* 66 Fed. Reg. 11202 (Feb. 22, 2001). The Services assume this process will resolve any concerns regarding adverse effects to ESA-listed species and designated critical habitat;
- EPA will work with States and Tribes to reduce or remove the detrimental effects of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- In States where EPA is the permitting authority for NPDES permits, EPA will consult with the Services on the issuance of those permits where required by ESA section 7.

1.1.1 Scope

The scope of the action includes all aspects of EPA's issuance and implementation of the 316(b) Rule, including issuance of NPDES permits containing 316(b) requirements for existing power generating facilities and existing manufacturing and industrial facilities that withdraw more than 2 million gallons of water per day from Waters of the United States and use at least 25 percent of the water they withdraw exclusively for cooling purposes. While the majority of permits issued under the new 316(b) Rule will be State issued permits, EPA has an ongoing role in the administration and enforcement of NPDES permits in the states that assumed the NPDES permitting authority. While the following regulations are not subject to this consultation, under CWA section 402(d) and its implementing regulations (40 C.F.R. § 123.44), EPA reviews proposed State NPDES permits and, when EPA determines the permit fails to be consistent with the requirements of the CWA, then EPA may assume the authority to issue permits to which it has raised objections. In addition, under CWA section 309, EPA has the authority to enforce

conditions and limitations in State NPDES permits. The Rule establishes these conditions and limitations as they pertain to the operation of CWIS.

In order to reliably estimate the probable individual or aggregate effects to ESA-listed species or designated critical habitat, EPA would need to know or reliably estimate the probable number of facilities that will be subject to the final Rule. Therefore, we ask whether EPA has structured their Rule to reliably estimate the probable number and location of facilities with CWIS that will be authorized by the Rule and their impact on federally listed species and designated critical habitat. Previously, the majority of facilities have not been required to provide EPA or the appropriate permitting authority specific information regarding the operation of the CWIS and impacts to federally-listed species and critical habitat. EPA knows general information about the power generating and manufacturing facilities (15 percent of the potentially regulated community), but it does not know the number, location, volume, and timing of water withdrawals (if any) from the approximate 3,155 manufacturing facilities. To rectify this paucity of information, the Rule requires all facilities to submit, as part of their NPDES permit application, specific information including; the facility's location, description of cooling water operations, source water biological data, and identification of threatened and endangered species that may be susceptible to impingement or entrainment at their facility. Depending on a facility's selected method of compliance for the impingement mortality standard, 2 years of biological monitoring data may also be required to be part of their permit application. In addition, owners and operators must identify all federally-listed threatened and endangered species and/or designated critical habitat that are or may be present in the action area.

Through the requirements described above, owners and operators will be responsible for determining if listed species and designated critical habitat are likely to occur in an area affected by their cooling water intake operations and for notifying the relevant permitting authority if they determine that such effects are likely to occur. This requirement assumes that owners/operators will have sufficient knowledge to determine the presence or absence of ESA-listed species, and designated critical habitat near their facility, and have the technical knowledge necessary to determine if their activity might have direct or indirect effects on these species or designated critical habitat. Some owners/operators may have sufficient knowledge to make these judgments. However, the following points highlight why only a fraction of facilities seem likely to satisfy the requirement.

- Within their biological evaluation (pg 60), EPA identified 21,039 instances where threatened or endangered species and facilities currently overlap.
- There is a reasonable expectation that a listed species may be directly or indirectly affected by a facility's CWIS if that structure overlaps with the range of a listed species, and those effects may rise to the level of "take" as defined by the ESA.
- Facilities subject to the 316(b) Rule are already required to seek an exemption through an ESA section 10 incidental take permit (16 U.S.C. 1539 (a)) or an ESA section 7 Incidental Take Statement (16 U.S.C. 1536(b)(4)) for activities that result in the taking of federally-listed species. To our knowledge, few facilities have sought or obtained incidental take coverage for effects to listed species that may occur as a result of operation of their CWIS.

Further evidence that not all facilities are likely to self-identify as affecting federally-listed species or designated critical habitat is discussed within the biological evaluation. EPA selected eight facilities with a high number of identified overlaps with federally-listed species for review in the belief that these permits were likely to contain a discussion of considerations made for threatened and endangered species. Despite EPA's selection of these facilities because of overlap with the habitat of threatened and endangered species, review of the eight permits indicated:

- None of the eight discharge permits reviewed had special conditions or requirements specifically aimed at protection or minimization of impingement or entrainment to threatened or endangered species;
- Where ESA considerations were noted, little detail was provided describing the methods used to establish a finding of no adverse risk;
- Where improvements to reduce impingement and entrainment through technological or management options were required, these requirements were due to concern for the resident aquatic community and not for specific threatened or endangered species; and
- Most concerns regarding facility impacts to aquatic organisms were focused on facility discharges particularly thermal pollution (which is regulated under CWA section 316(a)) and not with the impingement and entrainment effects more commonly associated with CWIS.

The above information illustrates the problem associated with relying solely on owners and operators to identify if their operations impact threatened and endangered species. To help rectify this ongoing issue, additional language was included in the Rule that requires permitting authorities (State Directors or EPA Directors) to transmit all permit applications subject to the Rule to the appropriate Field Office of the USFWS and/or Regional Office of the NMFS for a 60-day review prior to public notice of the draft or proposed permit. This information will be transmitted to the Services' Field or Regional offices upon receipt of the application. Directors are also required to provide public comment and notice of draft permits per 40 CFR 124.10. Permitting authorities are required to submit a copy of the fact sheet or statement of basis (for EPA-issued permits), the permit application (if any) and the draft permit (if any) to the appropriate Field Office of the USFWS and/or Regional Office of the NMFS. While the requirement to provide draft permits and notice of public comment to the Services is not a new provision, the requirement for Directors to provide permit application materials to the Services prior to issuing a draft permit is a new requirement. The 60-day review provided to the Services will allow the Services to inform Directors if an owner or operator has accurately self-identified any potential risk to federally-listed species and/or critical habitat. In addition, the Services may recommend protective measures prior to the Director issuing public notice of the draft permit. The Director would then include those recommended protective measures in the public notice of the draft permit.

The new conditions EPA imposes through the 316(b) Rule creates a process where the Services will have an opportunity to review the determinations submitted by the owners or operators regarding the potential effects of the CWIS to ESA-listed species prior to a draft permit being issued. If an owner/operator or Director does not include recommendations of the Services, EPA's commitment to exercise their oversight authority as described in the April 8, 2014, correspondence from EPA (attached as Appendix A) and as described this Opinion allows EPA

to correct any issues with the permit prior to issuance if EPA finds (giving deference to the views of the Services) that the permit will likely have more than minor detrimental effect or is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of designated critical habitat. This process established in the Rule and EPA's commitment to the oversight of the process will allow EPA to better estimate the number of facilities that will be subject to the final Rule so potential project impacts to federally listed species and designated critical habitat can be addressed.

1.1.2 Stressors

To determine if EPA has structured the Rule to reliably estimate the physical, chemical, or biological stressors that are likely to be produced as a direct or indirect result of their action, we review requirements in the Rule that allow EPA or the delegated State permitting authorities to identify stressors likely to be produced by permitted CWIS of existing facilities. Additionally, the Preamble to the Rule states EPA will use the full extent of its CWA authority to object to a State permit where EPA finds (giving deference to the views of the Services) that a State permit is likely to jeopardize the existence of ESA-listed species or adversely modify designated critical habitat.

We also evaluate the stressors identified in the biological evaluation. We provide a general overview and review in detail the following stressors: impingement and entrainment; thermal discharges; flow alterations; chemical discharge; and cumulative impacts (the aggregate effects of multiple facilities operating on one water source). We assess to what extent EPA has structured the Rule and supporting documentation to identify and estimate the stressors, and we identify reasons for uncertainty.

Regulatory Requirements—Identifying Stressors

For EPA-issued permits that may affect ESA-listed species or designated critical habitat, section 7(a)(2) consultation is required. Consultation information (50 CFR §402.14(c)) requirements include: description of the action; description of the specific area that may be affected by the action; description of ESA-listed species or designated critical habitat that may be affected by the action; description of the manner in which the action may affect ESA-listed species or designated critical habitat; relevant reports (e.g., the biological evaluation); and any other relevant available information on the action, the affected species, or critical habitat. Using this information from each permitted facility, EPA, with assistance from the Services, will be able to identify potential direct and indirect stressors. Therefore, for EPA-issued permits (approximately 8 percent of potentially regulated facilities), EPA is likely to know or reliably estimate the physical, chemical, or biotic stressors that are likely to be produced as a direct or indirect result of activities.

The Rule establishes information requirements that provide the basis for identifying and estimating potential stressors (122.21(r)(2)). The Director cannot waive these information requirements. However, several other information requirements are determined by the Director on a case-by-case basis. This Director determination for permit requirements on a case-by-case basis will be more unpredictable and inconsistent, making it difficult to accurately estimate potential stressors. Director determined Permit requirements and allowable modifications to BTA include:

- Three BTA Standards for Impingement Mortality involve Director-determined BTA or allows the Director to authorize less stringent standards;
 - 0.5 ft/sec through screen actual velocity, (the Director may authorize an exceedance of this standard for brief periods);
 - Modified traveling screens; and
 - Systems of technologies as the BTA for impingement mortality.
- BTA standards for entrainment;
- Site-specific impingement and entrainment requirements until 42 months after the effective date of the Rule, for existing units at existing facilities (i.e., not BTA standards);
- Additional measures for shellfish;
- Site-specific BTA Standards for Impingement Mortality for CWIS used for electric generating unit(s), with an annual average capacity utilization rating of less than eight percent (averaged over a 24-month period);
- Control measures, monitoring and reporting requirements that are designed to reduce or remove more than minor detrimental effects to federally-listed species and designated critical habitat, or avoid jeopardizing federally-listed species or destroying or adversely modifying designated critical habitat (e.g., prey base). Such control measures, monitoring and reporting requirements may include measures that may have been identified by the Services during coordination;
- Prior to 42 months after the effective date of the Rule, the Director determines on a case-by-case basis when the facility becomes subject to site-specific entrainment requirements;
- Schedule of requirements (i.e., after issuance of a final permit that establishes the entrainment requirements, EPA requires the owner or operator of an existing facility to comply with the entrainment standard as soon as possible, based on a schedule of requirements established by the Director); and
- Alternative requirements or additional BTA standards for entrainment for new units at existing facilities.

The biological evaluation states that a detailed evaluation of each of the potential effects of facilities subject to the proposed action is not possible because,

“...driven by vast uncertainty in the universe of regulated facilities, a lack of baseline source water biological characterization data, and a dearth of IM&E [impingement mortality and entrainment] monitoring data, the scope and magnitude of potential and actual effects is unknown for virtually all species and distinct population segments.”

Nonetheless, the biological evaluation provides a qualitative assessment of the stressors potentially arising from the proposed action and their possible direct or indirect effects on ESA-listed species and designated critical habitat. These stressors include: impingement and entrainment, thermal discharges, chemical discharges, altered flow regimes, and cumulative impacts (Table 3 EPA 2013). Further consideration of each stressor is provided in the following sections of this Opinion. In Table 3, EPA divides the stressors into those principally associated with the CWIS (i.e., impingement, entrainment, and flow alteration) and those associated with the discharge of cooling water (flow alteration, thermal discharge, and chemical discharge).

While discharge of cooling water is regulated 301, 306, or 316(a) of the CWA, and those regulations are not subject to this consultation, cooling water discharge is an indirect effect of

cooling water intake as regulated by the Rule and therefore considered in this Opinion. As described in the biological evaluation (pg 37), indirect effects of flow alteration, thermal discharge, and chemical discharge may include: physiochemical changes in aquatic habitat; secondary effects on upper trophic predators (e.g., by reduction in prey) or other species which compete for resources with ESA listed species (e.g., spawning habitat loss from flow reduction); and other changes in biological communities and/or ecosystem functions (USEPA 2013c). These may affect all life stages of ESA-listed species; however, EPA cannot further elaborate on these indirect effects because, as stated in the biological evaluation (USEPA 2013c):

“The exact nature and magnitude of these indirect effects would be species-specific based on the relative size and amount of overlap of habitat with facility and CWIS locations, dependence of affected prey populations, life cycle considerations, and many other factors. Given the lack of direct data available to EPA, indirect effects are difficult if not impossible to measure quantitatively. Accordingly, given the lack of data available, EPA did not attempt to estimate the relative magnitude or probability of these indirect effects on a species-specific scale, but instead acknowledges that these indirect effects are likely to occur, and may play a role when the effects of each are summed, or when [ESA-listed] species live in areas with a high density of regulated facilities.”

Table 3: CWIS Effects on Ecosystem Functions/Cumulative Impacts Potentially Affected, Both Directly and Indirectly, by 316(b) Regulations (Taken from USEPA 2013c)

Category	Direct/Indirect	Local/Regional/ National
A. Impingement and Entrainment (direct and indirect effects)		
<i>Effects on Individuals</i>		
Loss of individuals (direct effects)	Direct	Local/Regional/National
Phytoplankton	Direct	Local/Regional/National
Zooplankton (excluding fish larvae/eggs)	Direct	Local/Regional/National
Invertebrates	Direct	Local/Regional/National
Fish	Direct	Local/Regional/National
Non-fish vertebrates	Direct	Local/Regional/National
<i>Species and Population-Level Effects</i>		
Alteration of phenology of system (function of % water reduction in stream)	Direct	Local/Regional/National
Altered distribution of populations	Direct	Local
Altered niche space	Direct	Local/Regional
Altered stable age distributions of populations	Direct	Regional
Loss of keystone species	Direct	Local
Loss of T&E species	Direct	Regional
Novel selection pressure (e.g., negatively buoyant or stationary eggs)	Direct & Indirect	Local
Reduced/altered genetic diversity	Direct & Indirect	Regional/National
Reduced lifetime ecological function of individuals	Direct	Local/Regional
<i>Community and Trophic Relationships</i>		
Altered competitive interactions	Direct & Indirect	Local
Disrupted trophic relationships	Direct & Indirect	Local
Disrupted control of disease-harboring insects (e.g., mosquito larvae, etc.)	Indirect & Direct	Local/Regional
Increased quantity of detritivores	Indirect	Local
Loss of ecosystem engineers (due to trophic interactions)	Indirect & Direct	Local
Reduced potential for energy flows (e.g. trophic transfers)	Indirect	Local/Regional
Species diversity and richness	Direct & Indirect	Local/Regional/National
Trophic cascades	Indirect & Direct	Local/Regional
<i>Ecosystem Function</i>		

Table 3: CWIS Effects on Ecosystem Functions/Cumulative Impacts Potentially Affected, Both Directly and Indirectly, by 316(b) Regulations (Taken from USEPA 2013c)

Category	Direct/Indirect	Local/Regional/ National
Altered ecosystem succession	Indirect & Direct	Local/Regional
Decreased ability of ecosystem to control nuisance species (algae, macrophytes)	Indirect	Local
Disrupted cross-ecosystem nutrient exchange (e.g., up/downstream, aquatic/terrestrial)	Indirect	Regional
Disrupted nutrient cycling	Indirect & Direct	Local/Regional
Reduced compensatory ability to deal with environmental stress (resilience)	Direct & Indirect	Regional
Reduced ecosystem resistance	Indirect	Local/Regional
Reduced ecosystem stability (alternate states)	Indirect	Local/Regional
Sediment regulation	Indirect	Local/Regional
Substrate regulation	Indirect	Local
B. Thermal Effects		
Novel selection pressure (e.g., thermal optima, location of breeding, etc.)	Direct & Indirect	Regional/National
Altered phenology	Direct	Local/Regional
Links between temperature and metabolism		
Dissolved oxygen (physical)	Direct	Local
Dissolved oxygen (bacterial, respiratory rates)	Indirect	Local
Ecological energetic demands	Indirect	Local/Regional
Ecological nutrient demands	Indirect	Local/Regional
Altered algal productivity	Direct & Indirect	Local/Regional
Shifted nutrient cycling	Indirect & Direct	Local/Regional
C. Chemical Effects (anti-foulants, etc.)		
Altered survival/growth/production	Indirect & Direct	Local
Altered food web dynamics	Indirect	Local
D. Altered Flow Regimes (local and system-wide)		
Altered flow velocity	Direct & Indirect	Local/Regional
Altered turbulence regime	Direct & Indirect	Local/Regional
E. Cumulative Impacts (as a concentrated number of facilities)		
May push systems over the edge of nonlinearities in the system	Direct/Indirect	Local/Regional
Intensified CWIS effects (as above, Section B.)	Direct/Indirect	Local/Regional
Intensified thermal effects (as above, Section B.)	Direct/Indirect	Local/Regional

EPA's qualitative assessment included an analysis of the overlap between potentially regulated facilities (approximately 3,730) and the ranges or designated critical habitat of ESA-listed species (USEPA 2013). EPA estimates that a total of 3,490 facilities (94 percent) overlap with species' ranges, and 153 facilities (four percent) overlap with designated critical habitat (note: these estimates include ESA-listed species and designated critical habitat under the jurisdiction of both Services). Of the 805 positively identified power generating and manufacturing facilities, 768 (95 percent) overlap with one or more species, with 258 (37 percent) of such facilities withdrawing more than 125 mgd actual intake flow. Therefore, we interpret these data as follows:

- Most facilities overlap with at least one ESA-listed species; therefore, threatened or endangered species are likely to be exposed to the stressors potentially produced from most facilities;
- A large proportion of "overlap" facilities withdraw more than 125 mgd actual intake flow, indicating that the magnitude of each stressor has the potential to be large; and

- Few facilities (four percent) overlap with designated critical habitat, possibly because critical habitat has not been designated for most (66 percent) ESA-listed species.

The biological evaluation (page 8), states that some of these facilities are already in compliance with the impingement requirements of the Rule, as a result of State regulations; despite such regulations and the extent of overlap, EPA concludes that “data do not exist to determine the extent to which this geographical overlap impacts individuals or populations of [ESA-listed species].” In addition, EPA states that “under the final rule, all regulated facilities are required to submit baseline source water biological characterization data.” We agree with EPA that the availability and quality of information will increase as facilities collect and submit such data, as well as additional impingement and entrainment study results (USEPA 2013c). It is important that this data will now be provided to the Services for their review, and the Services will be able to provide comment to the Director regarding potential impacts to federally-listed species. This will enable the Director and EPA to more reliably estimate the effect of the stressors on ESA-listed species that are likely to be produced as a direct or indirect result of activities.

In the biological evaluation, EPA identifies other sources of uncertainty regarding the effects the Rule is likely to have on individual species (USEPA 2013c). These sources of uncertainty include:

- Lack of data: EPA was unable to identify the complete universe of facilities regulated by the Rule, and EPA found few data to estimate the effects of the Rule on ESA-listed species.
- Location of the facility: the location of the facility (the location of the CWIS was often unknown) relative to ESA-listed species or designated critical habitat was determined by geographic proximity to the range or habitat designations. It did not consider other parameters (i.e., upstream or downstream, nearbank vs. farbank) that may affect species and CWIS interactions.
- Location of the CWIS within the source water: the location and depth of the CWIS within the cooling water source can affect the overall impact on ESA-listed species, designated critical habitat, and vulnerable life stages.
- CWIS water withdrawal volume of facility: CWIS water withdrawal volume varies widely due to the size or generating capacity of the facility. Differences in volume were not considered and a single very large facility could have a disproportionate effect on ESA-listed species or designated critical habitat, if located nearby.
- Scope of CWIS modifications: EPA states that the nature and degree of required CWIS modifications will vary among the non-compliant facilities.
- Accuracy of habitat delineations: There is a wide range of variation in accuracy for habitat locations of non-federal identified habitats, including well-defined (GIS-delineated), approximate (hydrologic unit codes), and descriptive.
- Impacts on functional groups: EPA states that implementation of the Rule will result in CWIS modifications that will reduce impingement mortality and set facility-specific requirements for entrainment, resulting in differential beneficial effects among functional groups. EPA expects that “fish or pelagic species vulnerable to impingement would benefit to a greater degree than freshwater mussels where entrainment of eggs and vulnerable life stages constitute the great proportion of species loss.”

- Proportion of the ESA-listed species: EPA states that, with the exception of Federal designated critical habitats, there is no information to indicate the relative size or importance of the affected habitat to species or sub-populations, relative to the total species range or numbers.

In the BE, EPA states that the Rule expands and better defines the responsibilities of the compliant facilities seeking the NPDES permit, as well as the interaction of EPA, States, Tribes and Services in evaluating the potential impact to ESA-listed species and designated critical habitat. However, EPA acknowledges that initial determinations may be based on little available data. As facilities collect and submit source water baseline biological characterization data and additional impingement mortality and entrainment study results, EPA believes that data availability and quality will increase. It reasons that these data, collected over the period of years following NPDES permit renewal, will enable EPA and the Services to better determine the potential for any adverse impacts on ESA-listed species on a site specific basis.

As discussed in Section 7.1.1, the Rule requires the owner or operator to identify all threatened and endangered species that might be susceptible to impingement and entrainment at their CWIS and identify all federally-listed threatened and endangered species and/or designated critical habitat that are or may be present in the action area. In the April 8, 2014, correspondence, (Appendix A) EPA verified that whenever the phrase “action area” is used in the Preamble and Rule, it is to be interpreted in a manner consistent with the definition as found in the Services’ regulations implementing ESA section 7 at 50 CFR 402.02. In other words, “action area” includes all areas that may be directly or indirectly affected by the operation of a facility’s CWIS (i.e., impingement, entrainment, or other adverse effects caused by resultant environmental changes, including but not limited to, loss of prey, changes in water quality, and flow alteration). As such, owners/operators should identify all federally listed species and designated critical habitat that may be directly or indirectly affected by the result of a facility’s CWIS operation.

The Rule requires the Director to submit all permit applications to the Services. The Services can then verify if the list of ESA-listed species and designated critical habitat affected by CWIS operations is accurate. While the Rule does not require biological or environmental monitoring of CWIS impacts to ESA-listed species and critical habitat from all facilities; the Director may include such monitoring requirements that have been provided by the Services. If a State or Tribal Director fails to include the Services’ recommended monitoring requirements and the Services believe that the permit may result in more than minor detrimental effects to federally-listed species or designated critical habitat, the permit will be subject to EPA oversight provisions as outlined in the Preamble of the Rule, the April 8, 2014 correspondence from EPA (Appendix A), and in section 2.1 of this Opinion.

As stated above, the Rule requires that Directors provide permit applications to the Services for a 60-day review period, during which time, the Services may provide technical assistance and develop control measures, monitoring and reporting deemed necessary to minimize impacts on ESA-listed species and critical habitat. The Rule does not require the Director to include such control measures and monitoring/reporting requirements in the NPDES permit. However, if a Director fails to include such measures, monitoring and reporting and the Services believe the

permit will have more than minor detrimental effects on federally-listed species or designated critical habitat and contacts EPA, then EPA has committed to the following:

- i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
- ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - o Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

Through this process and EPA's commitment to oversight of the process, the Rule improves the availability of data and better defines the responsibilities of relevant parties. In addition, the process committed to in the Rule also will ensure that any effects from stressors that have more than minor detrimental effects or that rise to the level of jeopardizing a listed species or adversely modifying critical habitat will be addressed through State incorporation of appropriate measures into State permits, EPA's work with the State or Tribe to reduce or remove the minor detrimental impacts, including in appropriate circumstances by objecting to and federalizing the permit consistent with EPA's CWA authority, or EPA's commitment to exercise the full extent of its CWA authority to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.

Impingement and Entrainment

In the biological evaluation (pages 3, 10, 21-36, and others), EPA describes impingement and entrainment as potential stressors likely to be produced as a result of its action. Impingement affects juvenile (e.g., young-of-year) and adult stages of ESA-listed species, while entrainment affects vulnerable early life stages (USEPA 2013c). As stated in the biological evaluation, impingement and entrainment from CWIS:

"...may represent a substantial portion of annual reproduction. Consequently, [impingement and entrainment] may either lengthen species recovery time, or hasten the demise of these species much more so than for species that are abundant. For this reason, the population-level and social values of [ESA-listed species] losses are likely to be disproportionately higher than the absolute number of losses that occur. Unfortunately, available quantitative and qualitative data on the effects of CWIS on [ESA-listed] species are extremely limited. However, it is known that adverse effects of CWIS on [ESA-listed] species may occur in several ways:

- Individual organisms among [ESA-listed] species may suffer direct mortality as a consequence of impingement and entrainment. This direct loss of individuals may be particularly important because [ESA-listed] species have severely depressed population levels that are approaching local, national, or global extinction.
- Individuals may suffer injury, which may reduce survival probability, reproductive potential and fitness.
- [ESA-listed] species may suffer indirect harm if the CWIS substantially alters the food web in which these species interact. This might occur as a result of altered populations of predator or prey species, the removal of foundation species, or (for species with parasitic life history stages) the loss of host species.”

The biological evaluation provided limited data regarding the effect of impingement and entrainment on ESA-listed species. However, we were able to accumulate some information from a small subset of facilities that have completed section 7 consultations or habitat conservation plans regarding the effect of impingement and entrainment to sea turtles. We analyzed data from 14 facilities representing 7 to 33 years of monitoring per facility. Annual entrapment at each facility ranged from 0 to 949 turtles. For all facilities during all years, a total of 15,595 turtles were entrapped, an average of 46 turtles per facility per year (standard deviation = 165). The annual number of deaths at each facility was between 0 to 28 turtles. Data presented by the facilities for all years indicated that a total of 385 entrapped turtles died. This data represents a minimized impact on sea turtles that can be expected from impingement and entrainment, as the facilities summarized here had worked with NMFS through the ESA section 7 or the section 10 process to reduce their impacts on sea turtles. For further information on potential impacts to sea turtles, see Appendix C.

While quantitative and qualitative data on the effects of CWIS on the suite of ESA-listed species that may be affected by implementation of the Rule is limited, effects to more common species have been documented through various monitoring studies conducted at individual facilities. These studies provide further insight as to the effect impingement and entrainment may have on federally-listed species. For example, Bay Shore Power Plant located on Lake Erie near the mouth of the Maumee River conducted an impingement and entrainment study in 2005 and 2006. At the time of the study, the plant took in an estimated 638 million gallons of water/day for cooling water purposes (Ager et al 2008). The study estimated over 2.2 billion larval fish (approximately 10 percent of the larval population in the river), 208 million fish eggs, and 13 million juvenile fish were entrained on an annual basis. Additionally, an estimated 46 million fish were impinged annually (Ager et al 2008). While four species comprised the majority of entrainment and impingement losses, over 50 different species of fish were impinged or entrained during the course of the study.

An ecological assessment prepared by the U.S. Army Corps of Engineers (USACE) for the Upper Mississippi River and Illinois Waterways in 2000 provides a summary of the aggregate effects of impingement and entrainment from multiple facilities along a watercourse. The assessment contained a review of impingement and entrainment rates of fish attributed to 40 power plants. Eleven of the 40 plants had studies on impingement and/or entrainment rates, with most studies being 15 to 20 years old (West 2000). From the data available, the USACE estimated six of the power plants accounted for over 64 million fish entrained and over 56

million fish impinged on an annual basis (West 2000). Similar to the Bay Shore study, over 50 different species of fish were impacted, but a smaller set of species accounted for over 50 percent of impingement and entrainment losses (West 2000). In both instances, species considered relatively common comprised the majority of individuals impinged or entrained.

These studies illustrate the large number of species and individuals that may be impinged and entrained at a single facility, or through the combination of multiple facilities along a watercourse. So it is likely that any CWIS operating in the vicinity of listed aquatic organisms will cause impingement or entrainment of species protected under the ESA (see Appendix C for species under NMFS jurisdiction).

With regard to salmonids, we know that without screens and bypass systems, impingement (and resulting mortality) is more likely. Automatically cleaned screens with low approach velocity (less than 0.4 ft/s), small screen face openings (3/32" circular or square, or 1.75 mm continuous slots or rectangular openings) and bypass systems designed for fish swimming ability and behavioral traits, typically avoid most juvenile salmonid fish impingement or entrainment, and should be used anywhere juvenile salmonids could be present. With inadequate screen submergence, the water velocity directly between the water surface and the top of the screen can exceed the juvenile salmon swimming ability, potentially capturing fish above the screens until they fatigue or become prey.

EPA acknowledges the potential for impingement and entrainment to lengthen ESA-listed species recovery time, or hasten their demise. Effects to individuals include: death, injury, and indirect effects (e.g., resulting from trophic cascades). In the biological evaluation, EPA explains that it is unable to quantify the extent of the stressors, as a result of limited data. The Services agree with EPA that implementation of the standards set forth in this Rule reduces the impingement/entrainment of listed organisms. The Services also acknowledges that the ultimate extent of such impingement/entrainment is likely to be reduced by implementation of this Rule when compared to the extent that pre-dates the effective date of the Rule (i.e., prior to regulation by EPA). Upon taking effect, all facilities covered by the Rule will be required to comply with the Rule and therefore the appropriate effects analysis for this Opinion is to ask whether the levels of impingement/entrainment that will exist after the Rule takes effect and is implemented through NPDES permits are consistent with the obligations of section 7(a)(2) of the ESA.

The Rule requires owners and operators to provide any previously conducted entrainment performance studies as an information requirement of all existing facilities so the Director can establish site-specific entrainment standards. Additionally, facilities that withdraw more than 125 million gallons of cooling water/day must submit as part of their permit application, an entrainment characterization study that includes a minimum of 2 years of entrainment data collection. While the Rule does not require monitoring for impingement or entrainment for ESA-listed species at any facilities, the Director may establish additional monitoring for impingement, and the Director may also establish monitoring requirements for entrainment on a site-specific basis. Director determinations of monitoring may include recommendations provided by the Services as a result of their review of permit applications. The Rule also states that where the Director requires additional measures to protect federally-listed threatened or endangered species pursuant to 125.94(g) of the Rule, the Director shall require monitoring

associated with those measures. Allowing the Services to provide the Director impingement and entrainment monitoring recommendations tailored to address site-specific and species-specific issues will help address the following concerns associated with current monitoring efforts as identified in the biological evaluation:

- Because of the low population densities of ESA-listed species and the small volume of water sampled for impingement and entrainment studies, it is likely that many impinged or entrained individuals are never recorded;
- Species identification is difficult at early life history stages (e.g., egg, larvae), which comprise a large proportion of organisms impinged or entrained; and
- At facilities using fish return technology, individuals returned to the waterbody may not be recorded and the condition of the returned individuals is unknown.

In summary, EPA, in their biological evaluation, acknowledges that impingement and entrainment have the potential to either lengthen species recovery time, increase the number of deaths/injuries to ESA-listed species, or increase their extinction risk. EPA also acknowledges that most facilities overlap with at least one ESA-listed species or designated critical habitat. Lastly, EPA stipulates that it cannot quantify the effects of impingement and entrainment at this time due to limited data. The Rule does not establish monitoring requirements for the impingement or entrainment of ESA-listed species and designated critical habitat. Rather, the Rule establishes a process that allows the Director to work with the Services to determine if additional measures are necessary to reduce impacts to federally-listed species and designated critical habitat and if so, to determine the associated monitoring requirements. If the Director chooses to not include the measures and associated monitoring requirements in the permit and the Services have concerns that a permit will have more than minor detrimental effects on federally-listed species or critical habitat and contact EPA with their concerns, EPA has committed to the following:

- i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
- ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

To date, EPA has not been able to reliably estimate the impact of impingement and entrainment associated with CWIS operations on federally-listed species or critical habitat. However, the process of information exchange required in the Rule and EPA's commitment to the oversight of

that process as described above will allow EPA to more reliably estimate stressors associated with impingement and entrainment that are likely to be produced as a direct or indirect result of CWIS operations subject to the Rule. In addition, the process committed to in the Rule also will ensure that any effects from stressors that have more than minor detrimental effects or that rise to the level of jeopardizing a listed species or adversely modifying critical habitat will be addressed through State incorporation of appropriate measures into State permits, EPA's work with the State or Tribe to reduce or remove the minor detrimental impacts, including in appropriate circumstances by objecting to and federalizing the permit consistent with EPA's CWA authority, or EPA's commitment to exercise the full extent of its CWA authority to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.

Thermal discharges

Thermal discharges are regulated under sections 301, 306, or 316(a) of the CWA to protect a balanced indigenous population of shellfish, fish and wildlife in and on the water. While those sections of the CWA are not subject to this consultation, thermal discharges from facilities operating a CWIS regulated under this Rule are an interrelated action and thermal discharges are known stressors on aquatic environments.

As described in the biological evaluation, studies have shown that thermal discharges may substantially alter the structure of the aquatic community by modifying photosynthetic (Bulthuis 1987; Chuang et al. 2009; Martinez-Arroyo et al. 2000; Poornima et al. 2005) metabolic, and growth rates (Leffler 1972), and reducing levels of dissolved oxygen. Thermal pollution may also alter the location and timing of fish behavior including spawning (Bartholow et al. 2004), aggregation, and migration (USEPA 2002), and may result in thermal shock-induced mortality for some species (Ash et al 1974; Deacutis 1978; Smythe and Sawyko 2000). Thus, thermal pollution is likely to alter the ecological services provided by ecosystems surrounding facilities returning heated cooling water into nearby waterbodies.

Thermal discharge limitations vary by State, but typically discharges have to remain below 90°F. A study conducted in 2008 found that over 350 power plants across 14 different states reported discharges exceeding this threshold (Averyt et al. 2011). Large fish kills attributed to an exceedance of thermal discharges at power plants have been documented (NCDWQ 2010, Schwarzen, C. 2000 in Averyt et al 2011). Many common species of fish cannot tolerate water temperatures that exceed 90°F, and for many species of trout, water temperatures that exceed 80°F can be fatal (Seaby and Henderson 2007, Skaggs et al 2012). "Heat death" in fish occurs when temperatures of fish rise to a level where coordination in the central nervous system begins to break down (Seaby and Henderson 2007).

Dissolved oxygen likely plays a key role in temperature tolerance (Niklitchek 2001). Water temperature and dissolved oxygen levels are related, with warmer water generally holding less dissolved oxygen. In summer, the coupling of low dissolved oxygen at depth and water temperatures greater than 20°C above the thermocline limits non-stressful habitat due to a temperature-oxygen habitat squeeze (Coutant 1987). Sturgeon, for example, are more sensitive to low level dissolved oxygen conditions than some other fishes and become stressed in hypoxic conditions (generally under 5 mg/L), which may limit growth, metabolism, activity, and

swimming (Cech et al. 1984, Secor and Gunderson 1998, Secor and Niklitschek 2001, Secor and Niklitschek 2002, Cech and Crocker 2002, Campbell and Goodman 2004).

In summary, EPA acknowledges in the biological evaluation that temperature is “...a master environmental variable for aquatic ecosystems, affecting virtually all biota and biologically mediated processes, chemical reactions, as well as structuring the physical environment of the water column.” As described above, thermal discharges are regulated under sections 301, 306, or 316(a) of the CWA and thus, the Rule does not establish control measures or monitoring requirements for habitats of ESA-listed species or designated critical habitat impacted by thermal discharges. However, as thermal discharges are an indirect effect of CWIS operations, and the Rule allows Directors to base their determination of site specific entrainment requirements on the benefits of reducing thermal discharge impacts, Directors may require additional measures, monitoring and reporting under 316(b) to conserve federally-listed species or designated critical habitat. Measures established by the Director may reflect recommendations made by the Services during either the 60-day review or the public comment period. If the owner or operator or the Director choose not to incorporate Services’ recommended measures, and the Services contact EPA with concerns that the permit may cause more than minor detrimental effects to federally-listed species or critical habitat, then EPA will exercise its oversight authority, consistent with the Preamble to the Rule as clarified in the April 8, 2014 correspondence (Appendix A). To date, EPA has not been able to reliably estimate the impact of thermal discharge associated with CWIS operations on federally-listed species or designated critical habitat. However, more information will now be generated as the Rule promotes the exchange of information or technical assistance between the Services and the Directors. EPA now commits to the oversight of that process, which will allow EPA to more reliably estimate the physical, chemical, or biotic stressors that are likely to be produced as a direct or indirect result of thermal discharge activities.

Flow alteration

As described in the biological evaluation, the operation of CWIS, including water withdrawals and discharge returns, significantly alters patterns of flow within receiving waters, both in the immediate area of the CWIS intake and discharge pipe and in mainstream waterbodies. In ecosystems with strongly delineated boundaries (i.e., rivers, lakes, enclosed bays, etc.), CWIS may withdraw and subsequently return a substantial proportion of water available to the ecosystem. For example, of 521 facilities located on freshwater streams or rivers, 164 (31 percent) have an average intake greater than 5 percent of the mean annual flow of the source waters (USEPA 2013c). Based on the ratio of water demand to water supply, power plants are the major drivers of water stress in 44 basins across the United States (Skaggs et al. 2012). As EPA describes in the biological evaluation, such withdrawals are likely to have significant impact on the aquatic habitat, in general, and on ESA-listed species and designated critical habitat, especially in inland riverine environments.

All withdrawals are likely to alter flow characteristics of the waterbody including turbulence and water velocity (USEPA 2013c). As described in the biological evaluation, altered flow velocities and turbulence may lead to several changes in the physical environment, including: sediment deposition (Hoyal et al. 1995), sediment transport (Bennett and Best 1995), and turbidity (Sumer et al. 1996), each of which play a role in the physical structuring of ecosystems. Biologically, flow velocity is a dominant controlling factor in aquatic ecosystems. Flow has been shown to

alter feeding rates, settlement and recruitment rates (Abelson and Denny 1997), bioturbation activity (Biles et al. 2003), growth rates (Eckman and Duggins 1993), and population dynamics (Sanford et al. 1994).

In addition to flow rates, turbulence plays an important role in the ecology of small organisms, including fish eggs and larvae, phytoplankton, and zooplankton. In many cases, the turbulence of a waterbody directly affects the behavior of aquatic organisms, including fish, with respect to swimming speed (Lupandin 2005), location preference with a waterbody (Liao 2007), predator-prey interactions (Caparroy et al. 1998; MacKenzie and Kiorboe 2000), recruitment rates (MacKenzie 2000; Mullineaux and Garland 1993), and the metabolic costs of locomotion (Enders et al. 2003). The sum of these effects may result in changes to the food web or the location of used habitat, and thereby substantially alter the aquatic environment (USEPA 2013).

In the biological evaluation, EPA also acknowledges that flow alteration as a result of CWIS operation is likely to change over time as a result of climate change. Climate change is predicted to have variable effects on future river discharge in different regions of the United States, with some rivers expected to have large increases in flood flows, while other basins will experience water stress. For example, Palmer et al. (2008) predict that mean annual river discharge is expected to increase by about 20 percent in the Potomac and Hudson River basins, but to decrease by about 20 percent in Oregon's Klamath River and California's Sacramento River.

To summarize, in the biological evaluation, EPA states that CWIS may alter habitat that is essential to the long-term survival of ESA-listed species as a result of altered flow regimes or turbidity. Flow alterations may be caused by all degrees of withdrawals, not just those that withdraw a significant proportion of the mean annual flow of source waters. To date, EPA has not been able reliably estimate the effects of flow alteration on ESA-listed species and critical habitat. While the Rule does not establish control measures or monitoring and reporting requirements to reduce the effects of flow alteration on ESA-listed species and designated critical habitat, it does establish a process that allows the Director to work with the Services to determine the benefits of reducing impacts of flow alteration and in determining appropriate controls under section 316(b), including those that conserve ESA-listed species. If additional measures are necessary, the Services will be able to provide appropriate monitoring and reporting recommendations. The Director may then include these measures, monitoring, and reporting in the permit. If a State or Tribal Director chooses to not include the measures and associated monitoring requirements in the permit and the Services have concerns that a permit will have more than minor detrimental effects on federally-listed species or critical habitat and contact EPA with their concerns, EPA has committed to the following:

- i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
- ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and

- iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - o Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

The technical assistance process facilitated by the exchange of information as required in the Rule and EPA's commitment to the oversight of that process as described above will allow EPA to more reliably estimate stressors associated with flow alterations that are likely to be produced as a direct or indirect result of CWIS operations subject to the Rule.

Chemical discharges

As described in the biological evaluation, contaminated effluent is a byproduct of once-through cooling water systems. Chemical discharges are addressed in NPDES permits by either water quality-based effluent limitations or technology-based effluent limitations of the CWA. We consider chemical discharges in this consultation, because in the biological evaluation, EPA identifies chemical discharges as a stressor produced by operation of CWIS that fall under the purview of this Rule.

In the biological evaluation, EPA explains that toxic pollutants, such as metals, polycyclic aromatic hydrocarbons, pesticides, biofouling chemicals, or chlorine may be present in the discharge of CWISs. They conclude that such chemical discharges could lead to local extirpation of sensitive species, or to greatly altered biological communities due to chronic impacts on viability, growth, reproduction, and resistance to other stressors (USEPA 2013). To date, EPA has not been able to reliably estimate the effects of chemical discharges on ESA-listed species and designated critical habitat, as environmental monitoring and data collection has not been required from all facilities. The Rule does not establish specific control measures or monitoring and reporting requirements to reduce the effects of chemical discharge on ESA-listed species and designated critical habitat; however, it does establish a process that allows the Director to work with the Services to determine the benefits of reducing impacts of chemical discharge and in determining appropriate controls under section 316(b), including those that conserve ESA-listed species. If additional measures are necessary, the Services will be able to provide appropriate monitoring and reporting recommendations. The Director may then include these measures, monitoring, and reporting in the permit. If the Director chooses to not include the measures and associated monitoring requirements in the permit and the Services have concerns that a permit will have more than minor detrimental effects on federally-listed species or critical habitat and contact EPA with their concerns, EPA has committed to EPA has committed to the following:

- i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;

- ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - o Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

The technical assistance process facilitated by the exchange of information between the Director and the Services as required in the Rule, and EPA's commitment to the oversight of that process as described above will allow EPA to more reliably estimate stressors associated with chemical discharge that are likely to be produced as a direct or indirect result of CWIS operations subject to the Rule.

Aggregate Impacts

As described in the biological evaluation, cumulative impacts are the magnified environmental stressors created by regulated CWIS when two or more facilities are located nearby (USEPA 2013c). To avoid confusion with the regulatory definition of cumulative effects, we use the term "aggregate impacts." Aggregate impacts are likely to occur if multiple facilities are located in close proximity, such that they impinge or entrain aquatic organisms within the same source waterbody, watershed system, or along a migratory pathway of a specific species (e.g., striped bass in the Hudson River) (USEPA 2004). Aggregate impacts include the magnified effects of indirect effects associated with the operation of CWISs of two or more facilities.

EPA estimates that approximately 20 percent of potentially regulated facilities are located on waterbodies with multiple CWIS (USEPA 2004). Review of geographic locations of 316(b) facilities (approximated by CWIS latitude and longitude) indicates that facilities in inland settings are clustered around rivers to a greater extent than marine and estuarine facilities (USEPA 2013c). In the biological evaluation, EPA explains that aggregate impacts of clustered facilities may be significant, due to concentrated impingement and entrainment mortality, combined intake flows, and the potential for other impacts such as thermal or chemical discharges and flow alterations. EPA also notes that power generation demand and cooling intake water volume is typically at its annual maximum during mid-late summer, which is also a period of seasonal low flows and highest in-stream temperatures. Although low flows traditionally occur in late summer to early fall, drought conditions and manipulations of water levels may lead to low flow during other periods as well. Low flow is problematic when it overlaps with seasonal concentrations of eggs, developing young of the years, and migrating juveniles or adults (USEPA 2013c). EPA estimates that aggregate impacts may be greater in inland waters due to the following factors:

- the majority of national annual intake flow is associated with freshwater CWIS;
- freshwater plants use a greater relative volume of available fish habitat than marine or estuarine counterparts; and

- seasonal variation in power demand and river flow may increase entrainment potential during low-flow periods of the year (NETL 2009).

To summarize, in the biological evaluation, EPA acknowledges that the stressors described above are magnified when two or more facilities are located in close proximity; approximately 20 percent of facilities are located in waterbodies with multiple CWIS; and most facilities overlap with at least one ESA-listed species. Because the above stressors have the potential to lengthen species recovery time, hasten the demise of these species, or alter habitat that is critical to long-term survival, magnification of such stressors has a greater potential to jeopardize the continued existence of listed species and adversely modify critical habitat.

To date, EPA has not been able know or reliably estimate the aggregate impacts of CWIS operations on ESA-listed species and critical habitat. While the Rule does not establish control measures or monitoring and reporting requirements to reduce aggregate impacts from CWIS on ESA-listed species and designated critical habitat; it does establish a process that allows the Director to work with the Services to determine if additional measures are necessary to reduce aggregate impacts and if so, to determine the associated monitoring reporting requirements. The Director may then include these measures, monitoring, and reporting in the permit. If the Director chooses to not include the measures and associated monitoring and reporting requirements in the permit and the Services have concerns that a permit will have more than minor detrimental effects on federally-listed species or critical habitat and contact EPA with their concerns, EPA has committed to the following:

- i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
- ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

Summary

Stressors associated with the operation of CWIS as described above have the potential to significantly affect federally-listed species and designated critical habitat. EPA has structured the Rule to more reliably estimate these physical, chemical, or biotic stressors as they relate to federally-listed species and designated critical habitat. For permits issued by EPA on a facility by facility basis, EPA is likely to know or reliably estimate the physical, chemical, or biotic stressors that are likely to be produced as a direct or indirect result of activities as they are required to consult with the Services through the section 7(a)(2) process if the action may affect

listed species or critical habitat. For State-issued permits, the technical assistance process facilitated by the exchange of information between the Director and the Services as required in the Rule, and EPA's commitment to the oversight of that process as described in this Opinion and in the April 8, 2014, correspondence from EPA, will allow EPA to more reliably estimate stressors that are likely to be produced as a direct or indirect result of activities regulated under the Rule. Specifically, the Services will now be able to provide review and comment as to whether stressors to ESA-listed species have been correctly identified in permit applications. The following are those steps in the Rule and supporting documentation that outline this process:

- ESA-listed species and/or critical habitat that occurs in the action area for a facility and impacted by CWIS will be identified by the owner or operator and provided to the Services for verification;
- The Directors are required to send all permit application information to the Services and provide the Services with 60 days to review the information. If the Services provide control measures, monitoring or reporting requirements to reduce impacts associated with CWIS to the Director, the Director may include those in the permit;
- If the Director does not include the control measures, monitoring or reporting requirements recommended by the Services and the Services have concerns that a permit will have more than minor detrimental effects on federally-listed species or critical habitat and contact EPA with their concerns:
 - i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
 - ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
 - iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

1.1.3 Minimization of likely adverse effects

In regulations for new facilities (316(b) Phase I), EPA deemed closed-cycle recirculating systems to be the best technology available to minimize adverse environmental impacts resulting from the operation of CWIS. In the Rule, EPA requires the owner or operator of a new unit at an existing facility to reduce the design intake flow "to a level commensurate with that which can be attained by the use of a closed-cycle recirculating system" or to "demonstrate achievement of reductions commensurate with closed-cycle recirculating system." We agree that closed-cycle systems are the best technology available and are likely to reduce impingement of ESA-listed species and reduce impacts to designated critical habitat; however, it is not clear that closed-

cycle systems will minimize, as defined in the Rule, such impacts. In the Rule, minimize means “to reduce to the smallest amount, extent, or degree reasonably possible.” Without additional devices (e.g., screens or excluder bars), closed-cycle recirculation systems may still impinge listed species, which is take (or a more than minor detrimental, effect requiring a permit or exemption from the Services).

Impingement Standard

The BTA Standards for Impingement Mortality involving demonstrated ≤ 0.5 ft/sec through-screen velocity (design or actual) exceed velocities recommended by the Services (≤ 0.2 , 0.33 , or 0.4 ft/sec, depending on conditions) to protect salmonids and other sensitive fishes (FFTT 2011). For example, studies have indicated the federally-threatened delta smelt (*Hypomesus transpacificus*) are slow swimmers that are unable to sustain swimming velocities above 0.33 ft/s for more than a few minutes (Swanson et al 2000, Swanson et al 1998). Through screen velocities of 0.5 ft/sec would likely not provide adequate protection. Therefore, if facilities implement the BTA Standard for Impingement Mortality as found in the Rule, impingement of ESA-listed species is still likely to occur. This example demonstrates why the requirement for Directors to provide the Services an opportunity to review permit applications prior to issuing a draft and final permit per the Rule is a critical aspect of EPA’s action.

The Rule defines a velocity cap as “an open intake designed to change the direction of water withdraw from vertical to horizontal, thereby creating horizontal velocity patterns that result in avoidance of the intake by fish and other aquatic organisms. For purposes of this [Rule], the velocity cap must use bar screens or otherwise exclude marine mammals, sea turtles, and other large aquatic organisms.” Offshore is defined as a minimum of 800 feet from the shoreline and outside of the littoral zone. If an offshore velocity cap operates as intended (i.e., avoids intake of fish and other aquatic organisms), then this BTA Standard for Impingement Mortality minimizes impingement of ESA-listed species and designated critical habitat. While the Rule allows the Director to establish alternative procedures for visual or remote inspections that verify the effectiveness of the velocity cap, the Services will be provided an opportunity to recommend to the Director what inspection procedures should entail and notify EPA of any concerns as they relate to federally-listed species

The Rule defines modified traveling screens as “traveling water screens that incorporate measures protective of fish and shellfish, including but not limited to: screens with collection buckets or equivalent mechanisms designed to minimize turbulence to aquatic life; addition of a guard rail or barrier to prevent loss of fish from the collection system; replacement of screen panel materials with smooth woven mesh, drilled mesh, molded mesh, or similar materials that protect fish from descaling and other abrasive injury; continuous or near-continuous rotation of screens and operation of fish collection equipment to ensure any impinged organisms are recovered as soon as practical; a low pressure wash or gentle vacuum to remove fish prior to any high pressure spray to remove debris from the screens; and a fish handling and return system with sufficient water flow to return the fish directly to the source water in a manner that does not promote predation or re-impingement of the fish, or require a large vertical drop.” This BTA Standard for Impingement Mortality does not include several of the specifications recommended by NMFS and adopted by the USFWS to protect salmonids and other fishes (FFTT 2011), including: defined maximum screen face openings; spacing of trash racks; maintenance

schedule; debris management requirements; escape routes; sweeping velocities; and height/bottom requirements for screens. The Rule states that the Director may approve of fish being returned to water sources other than the original source water, which could result in the displacement of ESA-listed species or their prey. Additionally, returning fish or other species to water sources other than their source water may result in ESA-listed species being impacted due to the inadvertent transfer of disease or aquatic invasive species. Based on correspondence received from EPA on April 8, 2014, EPA verified that Directors will address any concerns from the Services regarding the return of aquatic species to waters other than their source waters. If the Services' concerns are not addressed and the permit would cause more than minor detrimental effects, the permit will be subject to the EPA oversight provisions as committed to by EPA as a part of their action. While, the modified traveling screen BTA Standard for Impingement Mortality as described in the Rule may not be protective enough of federally-listed species and designated critical habitat (e.g., prey base), the Services will be provided an opportunity to recommend to the Director additional site-specific and species-specific control measures during their review of the permit applications as afforded in the Rule.

The Rule allows an owner or operator to meet the BTA Standard for Impingement Mortality by operating a system of technologies, management practices, and operation measures that the Director determines is the best technology available, using information from the impingement technology performance optimization study. The range of possible systems, practices, and measures is wide and unspecified, and their efficacy is unknown. Therefore, we cannot conclude that this standard on its own is likely to minimize the impingement of ESA-listed species or critical habitat. However, as previously described, the Services will be provided an opportunity to recommend additional site-specific and species-specific control measures during their review of permit applications.

The Rule also allows a 12-month impingement mortality performance standard, which requires monthly monitoring. The Rule requires that impingement mortality be less than 24 percent:

$$\frac{\text{\# fish killed***}}{\text{\# fish impinged}} < 24 \text{ percent}$$

***After collected or retained in ≤ 0.56 inch sieve and held for 18 to 96 hours, or other time as specified by the Director*

The Rule indicates that the number of fish killed includes latent mortality, for all non-fragile species together that are collected or retained in a sieve with maximum opening dimension of 0.56 inches and kept for a holding period of 18 to 96 hours; it allows the Director to provide an alternate holding period. This Standard on its own does not appear to minimize the impingement of ESA-listed species or critical habitat. Instead it places a limit (24 percent) on the proportion of impinged "fish" that may be killed. This raises several concerns. EPA estimates 1.9 billion age-one equivalents are impinged and entrained each year (USEPA 2013d). In the Preamble of the Rule, EPA indicates this number could be in the hundreds of billions of aquatic organisms when plankton, fish eggs, and larvae are included. The authorization of so many mortalities - some of which may be listed-species - may jeopardize the continued existence of ESA-listed species, which often exhibit extremely low abundance. Additionally, the Standard does not

address the non-lethal fitness costs associated with impingement, such as injury or loss of reproductive success. These concerns further demonstrate why the review process afforded the Services in the Rule and EPA's commitment to exercise their oversight authority if necessary are critical elements of this action, as the impingement mortality performance standard on its own is still likely to result in a large amount of lethal and non-lethal take. However, EPA makes clear that the Rule does not authorize take, as defined by the ESA. Furthermore, the Rule requires that each permit include as a permit condition a statement that: "nothing in the permit authorizes take for the purposes of a facility's compliance with the ESA."

The Rule includes provisions for *de minimis* rates of impingement. The Rule states that in limited circumstances, rates of impingement may be so low at a facility that additional impingement controls may not be justified. However, EPA verified in their April 8, 2014, correspondence with the Services, that in circumstances where a Director determines a facility's rate of impingement is so exceptionally low as to not warrant additional impingement controls, the operation of CWIS may still have more than minor detrimental effects on federally-listed species if listed species are subject to impingement. A proposed permit that would cause more than minor detrimental effects to federally-listed species would be subject to EPA's oversight authority as committed to by EPA as a part of this action.

Based on the analysis above, implementation of the BTA Standards for Impingement Mortality on their own is unlikely to minimize adverse effects on ESA-listed species and designated critical habitat. Though some BTA Standards have the potential to minimize adverse effects (e.g. closed cycle and velocity cap), biological monitoring is needed to verify their effectiveness. Through ESA section 7 consultation on EPA issued permits and the technical assistance process with State or Tribal Directors facilitated by the exchange of information as established in the Rule, the Services will be able to provide to EPA or the Director additional site-specific and species-specific control measures, monitoring, and reporting recommendations to further enhance the protectiveness of these standards as they relate to federally-listed species. Examples of species-specific control measures the Services may recommend can be found in Appendix D. By including the Services recommendations for control measures, monitoring and reporting in the final permit, the State or Tribal Director will further reduce the impacts of CWIS operations on federally listed species and designated critical habitat. The Services expect, for purposes of this Opinion, that issues related to ESA-listed species will be adequately addressed in light of: the two opportunities for the Services to engage in the permitting process (in reviewing the permit application and the proposed permit), the obligation of State Directors to consider and address any information brought to its attention by the Services and make its permitting decisions based on the administrative record before it, the opportunity for public participation in the permitting process, and, finally, EPA's commitment to exercise its oversight authority to resolve any issues that arise.

Entrainment Standard

EPA gives discretion to the Director in determination of the entrainment standard. The Rule states that entrainment requirements "must reflect the Director's determination of the maximum reduction in entrainment warranted after consideration of factors relevant for determining the best technology available for minimizing adverse environmental impact at each facility." These determinations must be based on:

- Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of federally-listed threatened or endangered species and designated critical habitat (e.g., prey base);
- Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;
- Land availability inasmuch as it relates to the feasibility of entrainment technology
- and remaining useful plant life; and
- Quantified and qualitative social benefits and costs of available entrainment technologies of a sufficient quality and rigor for the director to make a decision.

The entrainment standards may also be based on:

- Entrainment impacts on the waterbody
- Thermal discharge impacts
- Credit for unit retirements occurring within the past 10 years
- Impacts on water consumption
- Availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water

If all technologies considered have social costs not justified by the social benefits, or have unacceptable adverse impacts that cannot be mitigated, the Director may determine that no additional control requirements are necessary beyond what the facility is already doing. The Director may reject an otherwise available technology as BTA standards for entrainment if the social costs are not justified by the social benefits. It is important to note that when making these determinations, the ESA and its legislative history indicate the preservation of endangered species should be given the highest priority (*TVA v. Hill* 437 U.S. 153 1978). Additionally, the Director may reject an otherwise available technology as a basis for entrainment requirements if the Director determines there are unacceptable adverse impacts, including: impingement, entrainment, or other adverse effects to ESA-listed species or designated critical habitat.

The Director-determined entrainment requirements are not required to but “may also reflect any control measures, monitoring and reporting requirements that are designed to minimize incidental take, reduce or remove more than minor detrimental effects to federally-listed species and designated critical habitat, or avoid jeopardizing federally-listed species or destroying or adversely modifying designated critical habitat. Such control measures, monitoring and reporting requirements may include measures or requirements identified by an appropriate Field Office of the USFWS and/or Regional Office of the NMFS Service during the 60 day review period pursuant to 125.98(h) of the Rule or the public notice and comment period pursuant to 40 C.F.R. 124.10. If required by the Director, the owner or operator must implement any additional control measures

EPA’s entrainment standard does not specifically reduce the impacts of entrainment on federally-listed species or designated critical habitat. Director determined entrainment requirements are likely to vary from State to State and from permit to permit. For EPA issued permits, EPA will consult pursuant to section 7 of the ESA with the Services. For State and Tribal-issued permits, per the Rule, the Services will be provided an opportunity to recommend site-specific and species-specific entrainment requirements to the Director to minimize incidental take and reduce

or remove more than minor detrimental effects of entrainment on federally-listed species and designated critical habitat. By including the Services' recommendations for control measures, monitoring and reporting in the final permit, the Director will further reduce the impacts of CWIS operations on federally-listed species and designated critical habitat. It is through this process, which the Services assume for this consultation will result in inclusion of control measures in State and Tribal-issued permits, and EPA's commitment as part of their action to working with States and Tribes to remove more than minor detrimental effects of permits when contacted by the Services that EPA has minimized the adverse effects of entrainment that are likely to result from EPA's action.

Incidental Take

In the Rule, EPA states, "This regulation does not authorize take, as defined by the Endangered Species Act, 16 USC 1532(19). The Fish and Wildlife Service and National Marine Fisheries Service have determined that any impingement or entrainment of federally-listed species constitute take. Such take may be authorized pursuant to the conditions of a permit issued under 16 U.S.C. 1539(a) or where consistent with an Incidental Take Statement contained in a Biological Opinion pursuant to 16 U.S.C. 1536(o)." In addition, EPA requires the Director to include the following language as a permit condition: "Nothing in this permit authorizes take for the purposes of a facility's compliance with the Endangered Species Act." These are statements of fact: incidental take may only be exempted or permitted by the Services.

Neither the Rule, nor permits issued per the Rule, authorizes the incidental take of ESA-listed species. However, if during their review of permits as afforded in the Rule, the Services determine that a facility's CWIS operations may result in incidental take, the Services may provide the Director additional control measures designed to minimize incidental take. If the Director chooses not to include these measures in the permit and the Services contact EPA with their concerns, the permit would be subject to EPA's oversight authority as committed to by EPA as a part of this action. This process, as outlined in the Rule and supporting documentation allow EPA to address incidental take that is reasonably certain to be caused by implementation of the Rule.

Summary

EPA has stated adverse environmental impacts include adverse effects to listed species (USEPA 2013f), and Section 316(b) of the CWA requires that the location, design, construction, and capacity of CWIS reflect the BTA for minimizing adverse environmental impacts. As such, when determining if a facility has met the requirements of the Rule, the Director should consider if a facility has minimized adverse effects to federally-listed species to the smallest amount, extent, or degree reasonably practicable. To aid Directors in their decision, EPA has established a requirement in the Rule for Directors to provide the Services with all NPDES permit applications subject to the Rule for a 60-day review period. The review period will allow the Services to review the impacts a facility may have on federally-listed species and designated critical habitat and provide the Director any control measures, monitoring and reporting requirements the Services believe are necessary to reduce those impacts. If a Director fails to include these recommendations in the permit and the Services contact EPA with their concerns, the permit would be subject to EPA's oversight authority as committed to by EPA as a part of this action. This process, as outlined in the Rule and supporting documentation will allow EPA

to minimize adverse effects that are reasonably certain to be caused by implementation of the Rule.

1.1.4 Identifies, informs, encourages, and screen applicants for potential eligibility under the Rule

In this section, we review requirements in the Rule that allow EPA to identify, inform, encourage, and screen applicants for potential eligibility under the Rule. The Rule is clear in that it applies to owners and operators of existing facilities with CWIS that withdraw > 2 mgd and use at least 25 percent of the water for cooling purposes. EPA was able to positively identify all electric facilities (n=575) that will be subject to the Rule; however they were unable to identify all manufacturing facilities. EPA will inform the regulated community by publishing the Rule in the Federal Register (the final rule will be codified in the Code of Federal Regulations) where it previously published the original regulations, the suspension of the original regulations, and the proposed regulations. It is likely that owners or operators who had previously been issued permits are aware that the Rule is in the process of being amended by EPA.

The current uncertainty surrounding the true number and location of manufacturing facilities is problematic. Adding to the uncertainty are those facilities that currently operate under administratively continued permits. If an applicant has submitted a complete permit application for a new permit and the Director is unable to issue a new permit in time, the previous permit is administratively continued without an opportunity for comment or review. Such extensions allow the facility to continue operating under the provisions of the old permit until the new permit is issued. As of EPA's latest count (March 2013), approximately 24 percent (n=1,617) of all major facilities and 17 percent (n=6,569) of all minor facilities were operating under administratively continued NPDES permits (USEPA 2013e). These numbers represent the "universe of NPDES facilities" and not just those facilities which may be subject to the Rule.

EPA addresses the uncertainty associated with administratively continued permits and their potential effects on federally-listed species with the following measures:

- As stated in the Preamble of the Rule, "given the history of litigation around this section [316(b)] of the Clean Water Act, states have, in some instances, administratively extended permits while awaiting final federal action..." EPA is now taking final action through the promulgation of the Rule. Some NPDES permits have been continued for a decade or more. For example, the 1991 NPDES permit issued by EPA to the Pilgrim Nuclear Power Station has been administratively continued since it expired in 1996 (i.e., 18 years).
- The Preamble of the Rule goes on to state that, "the Director should consider if any [administratively continued] permits would need additional updated information to support the permit issuance decision. The Director may, under 40 CFR 122.21(g)(13), request additional information including any application requirements in 122.21(r)." As the Rule requires owners and operators to identify all federally-listed threatened and endangered species and/or designated critical habitat that are or may be present in the action area (the area directly or indirectly affected by the operation of a facility's CWIS) as part of their permit application, this is new information that has not been required in the past and provides reason for a Director to request this new information from facilities operating under administratively continued permits.

Directors are required to provide the Services with a copy of every NPDES permit application pertaining to the Rule, allowing the Services to evaluate if a facility's CWIS operations adversely affect federally-listed species. Directors also have authority to request new information and to reopen administratively continued permits based on new information (e.g. impacts to federally-listed species not previously considered in previous permit applications). Given these provisions and EPA's commitment to exercise their oversight authorities when necessary, the Rule and supporting documentation are structured to allow EPA to identify, inform, encourage, and screens applicants of their eligibility under the Rule.

1.1.5 Monitoring and evaluation of adverse effects

EPA has established monitoring requirements for four of seven of the BTA Standards for Impingement Mortality. These are mainly non-biological monitoring requirements and include: daily flow intake for closed-cycle recirculating systems; daily intake flow for offshore velocity caps; and daily through-screen actual velocity (maximum = 0.5 ft/sec). Only the impingement mortality performance standard requires biological monitoring, which must be conducted at least monthly. The monthly monitoring requirement is not likely to be sufficient to identify the impingement of ESA-listed species because such organisms are often found in low abundance and/or intermittently, such that their impingement may not be detected by a once/per month monitoring effort. Such monitoring on its own is not sufficient to identify incidental take of impinged ESA-listed species.

EPA requires the Director to determine monitoring and reporting requirements for entrainment on a site-specific basis. For both impingement and entrainment, the Director may establish additional monitoring and reporting requirements and those requirements may include recommendations provided by the Services. As described in the Rule, where the Director requires additional measures to protect federally-listed threatened or endangered species or designated critical habitat pursuant to 125.94(g), the Director shall require monitoring associated with those measures. Directors are also required to submit facilities' annual reports submitted pursuant to 125.97(g) of the Rule, for compilation and transmittal to the Services.

As described above, the Rule does not establish specific monitoring or reporting requirements to evaluate likely adverse effects on ESA-listed species or designated critical habitat. However, through technical assistance facilitated by the information exchange and review process required per the Rule, the Services will be able to provide monitoring and reporting requirements for federally-listed species and designated critical habitat on a site-specific and species-specific basis. These recommendations will be provided to the Director for his consideration of inclusion in the permit. If a Director chooses not to include the Services' monitoring and reporting recommendations in the permit, and the Services have concerns that a permit will have more than minor detrimental effects on federally-listed species or critical habitat and contact EPA with their concerns:

- i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;

- ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - o Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

1.1.6 Compliance

We expect compliance with regulatory requirements because the Rule is enforceable by law, EPA and states may levy fines for non-compliance, and citizens may bring citizen suits. EPA expects Directors will comply with this rule and that permittees will comply with their permits because of the penalties for noncompliance. Additionally, the Services expect compliance because take incidental to operation of CWISs permitted through the implementation process described in this Opinion and incorporating the control measures, monitoring, and reporting recommended by the Services will be exempted from section 9 and section 4(d) take prohibitions.

To estimate the degree of compliance with the Rule and the extent to which enforcement-related activities may be taken, we reviewed EPA's most recent Annual Noncompliance Report, 2012. The report summarizes enforcement and compliance data on the "middle tier of NPDES facilities" which comprise 41,688 smaller facilities with individual NPDES permits. Of the 41,688 facilities, EPA had sufficient data to review the compliance status for 83 percent of the facilities (USEPA 2014). Over 8,300 facilities (~24 percent) were identified as having a Category I violation (i.e., a more serious violation). Accordingly, the report indicated over 8,600 informal and formal enforcement actions were taken to correct these violations, resulting in over \$16 million dollars in penalties and fines assessed (USEPA 2014). The total number of enforcement actions is higher than the total number of violations as informal enforcement may have required subsequent formal enforcement actions.

The rate of non-compliance with NPDES permits resulting in Category I violations as described above is concerning. When combined with violations of a less serious nature (those below the Category I level), this rate may be even higher. However, the number of enforcement actions taken indicates Directors and EPA do address non-compliance issues and seek means to remedy them.

Per the Rule, owners and operators are required to identify all federally-listed threatened and endangered species and/or designated critical habitat that are or may be present in the action area of their CWIS. As verified by EPA, the phrase "action area" as used in the Preamble and Rule, is to be interpreted in a manner consistent with the definition as found in the Services' regulations implementing ESA Section 7 at 50 CFR 402.02. In other words, "action area" includes all areas that may be directly or indirectly affected by the operation of a facility's

CWIS. Additionally, as described in the biological evaluation and in this Opinion, direct and indirect effects may include impingement, entrainment, or other adverse effects caused by resultant environmental changes, including but not limited to, loss of prey, changes in water quality, and flow alteration. The identification of ESA-listed species and the potential direct and indirect effects will now be provided by the Director to the Services for the Services' review and comment prior to publication of a draft and final permit. The exchange of information between the Director and the Services will help identify any concerns with CWIS operations as they relate to federally-listed species and designated critical habitat. While, this process does not require Directors or owners and operators to implement recommendations made by the Service to reduce impacts to federally-listed species; EPA, as a part of this action, has committed to exercising their oversight authority when requested to do so by the Services if a permit will cause more than minor detrimental effects to federally listed species or designated critical habitat. The Services expect compliance with their recommended control measures, monitoring and reporting because incidental take exemption will be afforded to EPA when the Rule, including its implementation process, is carried out as described in this Opinion. In addition, any take incidental to the operation of a CWIS permitted under the Rule through the implementation process described in this Opinion will be exempt from Section 9 and Section 4(d) prohibitions if the owner/operator implements enforceable control measures, monitoring, and reporting as agreed upon by the owner/operator and the Services, and as reflected in the permit. It is through this process, and EPA's commitment as part of their action to the oversight of the process, that allows EPA to encourage, monitor/evaluate impacts to ESA-listed species, and enforce compliance with the Rule.

1.1.7 Adaptive management

In this section, we evaluate if EPA structured the Rule to allow them to change it or activities authorized under it, if deemed necessary, to minimize unanticipated impacts on listed species and critical habitat. The Rule does not require the owner or operator to monitor for unanticipated (or anticipated) impacts to ESA-listed species or designated critical habitat; however, the Preamble describes the authority the Director has to modify a permit if such unanticipated impacts occur. As described in the Preamble, "the NPDES regulations also allow a Director to modify a permit during the term of the permit, consistent with the Federal regulations at 40 CFR sections 122.62, 122.63, 122.64, and 124.5. Among other things, under 40 CFR 122.62, reasons for permit modification include new information, not available at the time of permit issuance, including information on newly listed threatened or endangered species or federally-designated critical habitat (or unanticipated impacts thereto) received that would have justified the application of different permit conditions at the time of issuance."

The biological evaluation states that the true impact of CWIS may be higher than estimated if ESA concerns are not revisited regularly during facility relicensing or permitting activities. For example, a review of the potential geographic overlap between ESA-listed species and licensed commercial nuclear power facilities in the United States was conducted in 1997 (Sackschewsky 1997). At that time, approximately 484 ESA-listed species were identified as potentially occurring near one or more of the 75 facility sites that were examined. Despite the fact that no quantitative take data of ESA-listed species were obtained or analyzed, this review required updating in only a few years because:

- nearly 200 species were added to the ESA list between 1997 and 2003;

- critical habitat were newly designated for many species; and
- significantly more information became available online, allowing for more accurate and efficient evaluations of ESA-listed species' potential presence near power plants (Sackschewsky 2004).

Sackschewsky reevaluated approximately half of the original facilities identified in 1997 (38 of 75) six years later and found overlap with 452 ESA-listed species, nearly as many found in all facilities examined in 1997 (Sackschewsky 2004). Although information about each species was gathered to support an assessment of the probability of occurrence at each of the reactor sites, no attempt to assess take was completed. Reviewing these issues, the Nuclear Regulatory Commission concluded that regular review of ESA compliance at each licensed commercial nuclear power generating facility was warranted, particularly due to the periodic updating of species and designated critical habitat areas on the ESA lists. In the biological evaluation, EPA states, "Similarly, regular reviews of ESA compliance at 316(b) regulated facilities is warranted in the future."

As part of the Rule, all facilities will be required to better characterize the waters in the area of influence of their CWIS, including the identification of ESA-listed species. Additionally, Directors can require facilities to collect additional information if data is missing, newly-listed species or newly-designated critical habitat are located in the vicinity of the facility, or other environmental conditions (e.g., water quality, flow) have changed since earlier studies. This information can include source water baseline biological characterization data, such as: species present (including threatened and endangered), species susceptibility to impingement and entrainment, spawning periods, and seasonal patterns of the local presence of species. The Services will now have an opportunity to review all information contained within the permit application and will be able to provide the Director with monitoring and reporting recommendations that are appropriate to assess unanticipated (or anticipated) impacts to ESA-listed species or designated critical habitat. If the Director includes the monitoring recommendations provided by the Services in a permit, Directors are required to submit to EPA the results of such monitoring on an annual basis. These reports will then be transmitted to the Services. If impacts associated with CWIS operations are affecting federally-listed species and designated critical habitat in unanticipated ways after a permit has been issued, the Services and EPA can request the Director reopen the permit. By including a process where appropriate monitoring and reporting for federally-listed species can be developed and implemented on a species-specific and site-specific basis, and EPA committing to exercising their oversight authority if requested by the Services when a permit will have more than minor detrimental effects to federally listed species, the Rule allows EPA to use their authorities to request modifications to issued permits in order to minimize unanticipated impacts on listed species and critical habitat.

8.0 Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered by this Opinion. Future Federal actions

that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

Declines in the abundance or range of many federally-threatened, endangered, and other special status species are attributable to various human activities on Federal, State, and private lands, such as human population expansion and associated infrastructure development; construction and operation of dams along major waterways; water retention, diversion, or dewatering of springs, wetlands, or streams; recreation, including off-road vehicle activity; expansion of agricultural or grazing activities, including alteration or clearing of native habitats for domestic animals or crops; and introductions of non-native plant, wildlife, or fish or other aquatic species, which can alter native habitats or out-compete or prey upon native species. Given the action area has been identified as waters over which EPA has jurisdiction, from which existing facilities withdraw water for cooling purposes, many of these activities are expected to continue within the range of various federally protected wildlife, fish, and plant species, and could contribute to cumulative effects to the species within the action area. Species with small population sizes, endemic locations, or slow reproductive rates will generally be more susceptible to cumulative effects.

9.0 Integration and Synthesis of Effects

EPA proposes to promulgate regulations under 316(b) of the CWA to establish requirements for all existing power generating facilities and existing manufacturing and industrial facilities that withdraw more than two million gallons per day (mgd) of water from Waters of the U.S. and use at least 25 percent of the water they withdraw exclusively for cooling purposes. The action will occur throughout the Waters of the U.S., i.e., the action area. The proposed action is likely to adversely affect the species and critical habitats listed in Tables 2 and 3. Here, we integrate information presented in this Opinion to summarize stressors and the likely consequences of exposing listed resources to these stressors.

A significant portion of the nation's waters have been impacted by anthropogenic stressors described within this Opinion. Based on available information, impingement and entrainment has resulted in the death or injury of billions of aquatic organisms, flow regimes have been altered, water quality has been degraded by physical and chemical pollutants, and ecosystems have been altered by a combination of these and other stressors. The operation of CWIS at power generating and manufacturing facilities contributes to all of these stressors.

Power generating facilities are estimated to use between 60 billion and 200 billion gallons of water per day (Kenny et al. 2005, Averyt et al. 2011). These withdrawals account for 41 percent of all fresh water use in the United States. In some instances, intake from one facility can represent more than five percent of the average annual flow of its source water. While much of this water is eventually returned to the source, it is returned at temperatures that are as much as 50°F warmer than intake temperatures (Madden 2013). Thermal pollution can have a wide range of effects on aquatic communities including altering spawning and migration patterns to altering chemical properties of water by reducing dissolved oxygen (Madden 2013). Elevated water temperatures in streams, lakes, and rivers as a result of climate changes are projected to further exacerbate thermal pollution effects. In addition to thermal pollution, discharges from 316(b)

regulated facilities can include toxic pollutants, such as metals, polycyclic aromatic hydrocarbons (PAHs), pesticides, biofouling chemicals, or chlorine (USEPA 2013c)

EPA estimates that hundreds of billions of plankton, fish eggs, and larvae are lost every year as a result of impingement or entrainment for cooling water withdrawals (USEPA 2013f). Other studies conducted at individual facilities appear to support this estimate (Seaby and Henderson, 2007, Rossman 1986). When examining the number of ESA-listed species lost as a result of impingement and entrainment, EPA extrapolates that more than 65,000 eggs, larvae and adults of ESA-listed fish and sea turtles are lost on an annual basis (USEPA 2013c). As stated in the biological evaluation, aquatic species are disproportionately imperiled relative to terrestrial species; 39 percent of freshwater and diadromous fish species (Jelks et al. 2008), 67 percent of freshwater mussels (Williams et al. 1993) and 48 percent of crayfish (Taylor et al. 2007) are classified as special concern, threatened, or endangered. Given these numbers, the amount of direct loss of ESA-listed species due to impingement and entrainment is probably much higher than estimated by EPA, as ESA-listed species are found at low population densities, and the volume of water sampled by facility-level impingement and entrainment studies is low.

Our Programmatic Effects Analysis assesses whether, and to what degree, EPA structured the Rule to establish processes that require EPA, the owner or operator, and the Directors to collectively implement the provisions of section 316(b) of the CWA in a manner that addresses adverse effects to listed species, and ensures the operation of facilities subject to the Rule are not likely to jeopardize the continued existence of endangered or threatened species or destroy or adversely modify designated critical habitat. We addressed this issue by answering seven questions:

First, we concluded that EPA has structured the Rule to better estimate the number of facilities that may adversely affect ESA-listed species and designated critical habitat. While EPA is currently unable to identify all facilities that will be subject to the Rule and thus quantify impacts to listed species associated with CWIS operations, per the Rule, facilities will have to identify threatened and endangered species and/or designated critical habitat that are or may be within the action area. The Services will now have an opportunity to review these determinations prior to a draft permit being issued, provide technical assistance to the Directors regarding the species lists, and the Services may notify the Director or EPA of any inaccuracies or discrepancies that may exist. Thereby, facilities whose operations impact listed species or critical habitat will be correctly identified.

Second, we concluded the Rule allows EPA to more reliably estimate the physical, chemical, or biotic stressors that are likely to be produced as a direct or indirect result of their action. As previously discussed, impingement and entrainment rates of fish at larger facilities can be in the billions and smaller facilities may impinge and entrain millions. Other stressors, including flow alteration and chemical discharge, can also have significant impacts on the aquatic environment.

The information exchange between the Director and the Services established in the Rule provides a process of technical assistance whereby impacts associated with these stressors will be more accurately identified by the Services, as owners, operators, and Directors may not have the expertise necessary to do so. For purposes of this consultation, the Services assume that

State and Tribal Directors will include Services' recommended measures for protection of species in final permits. Additionally, EPA's commitment to the oversight of that process as described in the Preamble to the Rule as clarified in the April 8, 2014 correspondence from EPA (attached as Appendix A), will allow EPA to more reliably estimate stressors that are likely to be produced as a direct or indirect result of activities regulated under the Rule. Specifically:

- Owners' or operators' identification and determinations of ESA-listed species and critical habitats impacted by their CWIS in their permit application will be provided to the Services for verification;
- The Directors are required to send all permit application information to the Services and provide the Services with 60 days to review the information. If the Services provide control measures, monitoring or reporting recommendations to reduce impacts associated with CWIS to the Director, the Director may include those in the permit;
- If a Director chooses not to include the Services' monitoring and reporting recommendations in the permit, and the Services have concerns that a permit will have more than minor detrimental effects on federally-listed species or critical habitat and contact EPA with their concerns:
 - i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
 - ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
 - iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

Third, we concluded EPA structured the Rule to minimize the adverse effects of impingement, entrainment, and other stressors produced by CWIS on ESA-listed species and designated critical habitat. As described in our analysis, the Impingement Standards and Director determined Entrainment Standard provided in the Rule are not designed to specifically minimize impacts to ESA-listed species. However, the Services will be able to provide site-specific and species-specific control measures, monitoring and reporting recommendations through the review process. As EPA was unable to provide specific information on each facility's CWIS operations and associated impacts to federally listed species for purposes of this consultation, the Services' development of control measures is more appropriate during the review of each facility's permit application. EPA's oversight commitment provides assurance that permits that may result in more than minor detrimental effects to listed species or designated critical habitat will be corrected before issuing.

Fourth, we concluded that EPA has structured the Rule to identify, inform, and encourage all eligible applicants of their eligibility under the Rule. EPA was unable to identify all eligible facilities for purposes of this consultation, and eligible facilities may continue to operate under administratively continued permits. However, the Rule requires owners and operators provide updated information on impacts to ESA-listed species as part of their permit applications. This information was not previously required and is information a Director would need to support his/her permit issuance decision for facilities with administratively continued permits. A Director's ability to reopen administratively continued permits for new information along with EPA's commitment to exercise their oversight authorities when necessary, allow EPA to identify, inform, encourage, and screens applicants of their eligibility under the Rule.

Fifth, we concluded that EPA has structured the Rule to continuously monitor and evaluate adverse effects associated with CWIS on ESA-listed species and designated critical habitat. While the Rule does not establish specific monitoring or reporting requirements to evaluate adverse effects on ESA-listed species or designated critical habitat, it does allow those monitoring and reporting requirements to be developed on a site-specific and species-specific basis via technical assistance facilitated by the exchange of information between the Director and the Services. One of the Services' assumptions for this consultation is that the Services anticipate where necessary, State and Tribal Directors will incorporate the control measures, monitoring, and reporting recommendations provided by the Services through technical assistance facilitated by the exchange of information between the Directors and the Services into NPDES permits that contain 316(b) requirements. If a Director chooses not to include the Services' monitoring and reporting recommendations in the permit, and the Services have concerns that a permit will have more than minor detrimental effects on federally-listed species or critical habitat and contact EPA with their concerns, EPA has committed to the following oversight process described in the Preamble to the Rule and as clarified in the April 8, 2014 correspondence with the Services (attached as Appendix A):

- i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
- ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - o Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

Sixth, we concluded EPA has structured the Rule to encourage, monitor/evaluate, and enforce compliance regarding ESA issues. We have little data indicating EPA has previously used its oversight authority to review and object to State issued permits specifically to reduce the impacts

of NPDES permits on ESA-listed species. However, available data does indicate that EPA and Directors do take enforcement actions to correct non-compliant NPDES permits. Additionally, EPA expects a high rate of compliance with the Rule and any measures that the Services may provide through technical assistance. The exchange of information between the Director and the Services required in the Rule will help identify any concerns with CWIS operations as they relate to federally-listed species and designated critical habitat. The Directors may address those concerns through NPDES permit conditions that implement the Services control measures, monitoring, and reporting recommendations. While, the Rule does not stipulate that Directors must include recommendations made by the Services to reduce impacts to federally-listed species in the permit, one of the Services' assumptions for this consultation is that the Services anticipate where necessary, State and Tribal Directors will incorporate the control measures, monitoring, and reporting recommendations provided by the Services through technical assistance facilitated by the exchange of information between the Directors and the Services into NPDES permits that contain 316(b) requirements. In addition, in the Preamble to the Rule and as clarified in the April 8, 2014 correspondence (attached as Appendix A), EPA, as a part of this action, has committed to exercising their oversight authority when requested to do so by the Services in cases where a permit will cause more than minor detrimental effects to federally-listed species or designated critical habitat.

Seventh, we concluded the Rule is structured to inform EPA of unanticipated impacts to ESA-listed species and, if necessary, allow EPA to minimize such unanticipated impacts on listed species and critical habitat. State Directors have the ability to modify a permit during the term of the permit if new information, including information on newly listed threatened or endangered species or federally-designated critical habitat (or unanticipated impacts thereto) is received that would have justified the application of different permit conditions at the time of issuance. EPA also has the authority to object to issuance of permits that will result more than a minor detrimental effect on ESA-listed species or critical habitat or result in jeopardy to species and/or destruction and adverse modification of critical habitat. In both cases, the Rule establishes a process where:

- The Services will have the opportunity to provide Directors with appropriate monitoring recommendations designed to detect impacts of CWIS operations on federally-listed species and critical habitat. Information provided as a result of this monitoring will allow Directors to reopen and modify permits if necessary;
- EPA will work with States and Tribes to remove the detrimental effects of permits if requested by the Services to do so.

10.0 Conclusion

After reviewing the current status of the species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that EPA's action, as proposed, is not likely to jeopardize the continued existence of ESA-listed species listed in Tables 2 and 3 of this Opinion and is not likely to destroy or adversely modify designated critical habitat identified in Tables 2 and 3.

As described in the Rule and this Opinion, the operation of CWIS can have significant adverse effects on the aquatic environment and federally-listed species. EPA's Rule establishes a process (Figure 3) whereby the Services will be provided an opportunity to review permit applications of each facility seeking compliance with 316(b) of the CWA, either during a section 7 consultation with EPA or during review of every permit application submitted to a State or Tribe, and analyze impacts to federally-listed species and designated critical habitat that may result from operation of the facility's CWIS. During this review, the Services will have an opportunity to recommend control measures, monitoring and reporting recommendations on a site specific and species specific basis that will minimize adverse effects of CWIS operations. If the Services contact EPA with concerns that a State or Tribal permit will have more than minor detrimental effects on federally-listed species or critical habitat that cannot be resolved with the State or Tribal permitting authority:

- i. EPA will coordinate with the State or Tribe to ensure that the permit will comply with all applicable CWA requirements and will discuss appropriate measures protective of federally-listed species and critical habitat;
- ii. EPA will work with the State or Tribe to reduce or remove the detrimental impacts of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- iii. EPA will exercise the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat.
 - o Based on correspondence received from EPA on April 8, 2014, EPA will give deference to the views of the Services with regard to effects on federally-listed fish and wildlife resources.

Therefore, it is our opinion that this Rule has built in a sufficient process to insure that it is not likely to result in an appreciable reduction in the likelihood of both the survival and recovery of any listed species by reducing the reproduction, numbers or distribution of that species. It is also our opinion that the process insures that this Rule is not likely to result in destruction or adverse modification of critical habitat. The process achieves this through a comprehensive suite of requirements, including, but not limited to:

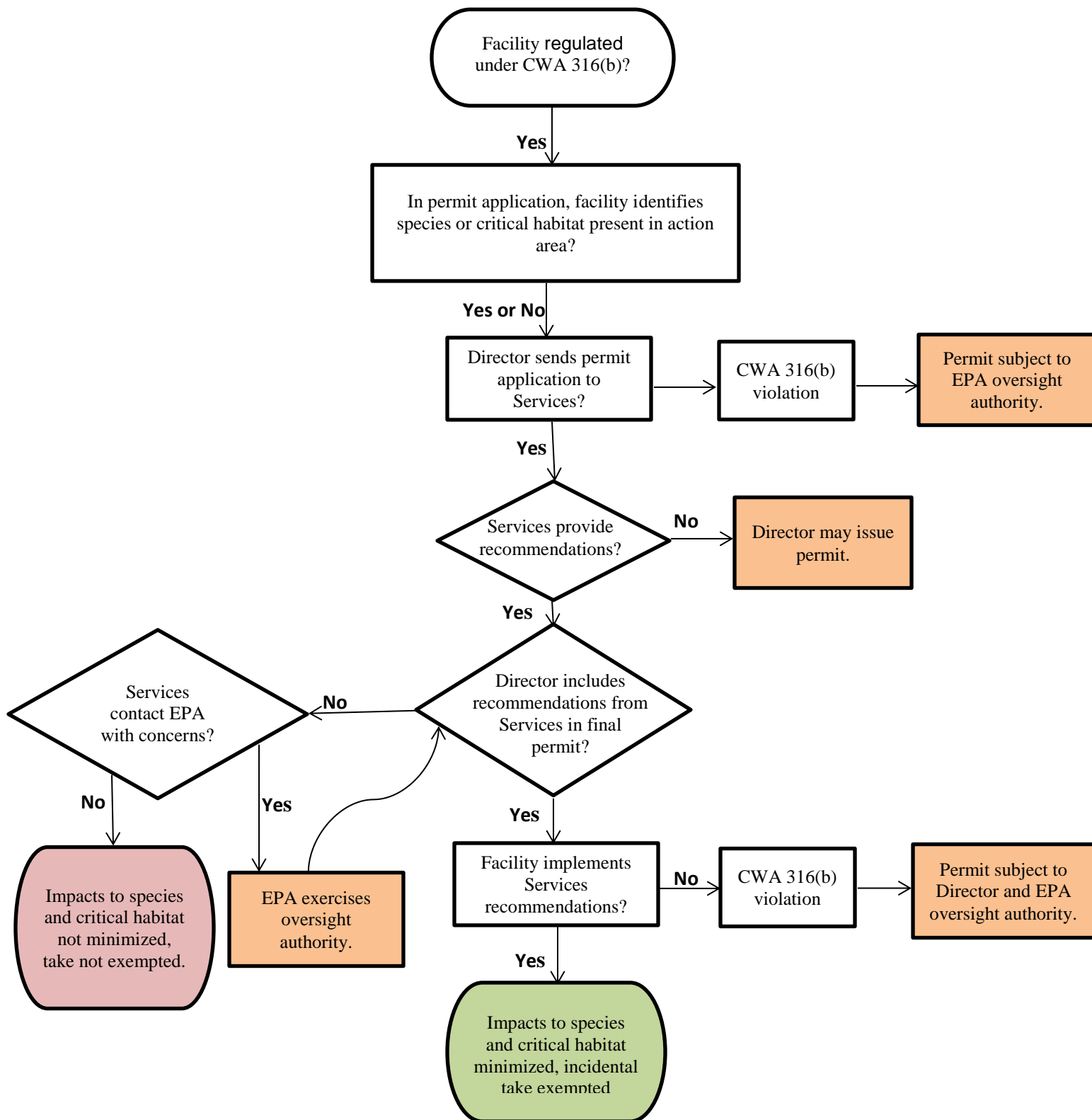
- Ensuring every permit application is provided to and reviewed by the Services ,thereby allowing the Services to provide meaningful input to State Directors early in the permit application process so that measures to address ESA-listed species may be incorporated into State permits;
- The Services or EPA identifying administratively continued permits which are likely to have more than minor detrimental effects on federally-listed species or critical habitat, contacting the State to seek to remedy the situation (for instance by requesting new information from the facility when necessary) and EPA or the Services requesting that the State issue a new permit when appropriate to resolve the concerns of the Services; and

- Ultimately ensuring that no permit is issued that is likely to jeopardize the continued existence of an ESA-listed species or result in the destruction or adverse modification of designated critical habitat by either (a) incorporation into State permits conditions necessary to avoid jeopardy to ESA-listed species or adverse modification to critical habitat; or (b) if the such conditions are not incorporated, preventing issuance of the State permit by exercising the full extent of its CWA authority, to object to a permit proposed by a State where EPA finds (giving deference to the views of the Services) that a State or Tribal permit is likely to jeopardize the continued existence of such species or result in the destruction or adverse modification of such critical habitat jeopardizing permit.

We base our conclusion, in part, on the following assumptions:

- The Services will receive all permit applications upon receipt by the Director for a 60 day review prior to publication of a draft permit as required per the Rule;
- The Services anticipate that where necessary, State and Tribal Directors will incorporate the control measures, monitoring, and reporting recommendations provided by the Services through technical assistance facilitated by the exchange of information between the Directors and the Services into site-specific NPDES permits that contain 316(b) requirements;
- The control measures, monitoring, and reporting developed by the Services through technical assistance with the Directors will minimize the adverse effects of CWIS to levels that will avoid jeopardy to species and/or destruction and adverse modification of critical habitat;
- In the case of State permits that have been administratively continued, if the Services or EPA identify a permitted action by a facility that meets the eligibility requirements of the rule which is likely to have more than a minor detrimental effect on Federally-listed species or critical habitat, then the Services or EPA will contact the State to seek to remedy the situation (for instance by requesting new information from the facility when necessary). EPA will provide support and assistance to the Services in working with the State or Tribe. EPA and States have no authority to require changes to an expired, administratively continued permit. Instead, Directors have authority to issue a new permit. Therefore, EPA or the Services could request that the State issue a new permit. *See* 66 Fed. Reg. 11202 (Feb. 22, 2001). The Services assume this process will resolve any concerns regarding adverse effects to ESA-listed species and designated critical habitat;
- As discussed in the preamble of the Rule and the April 8, 2014 correspondence (Attachment A), EPA will work with States and Tribes to reduce or remove the detrimental effects of the permit, including, in appropriate circumstances, by objecting to and federalizing the permit where consistent with EPA's CWA authority; and
- In States where EPA is the permitting authority for NPDES permits, then EPA will consult with the Services on the issuance of those permits where required by ESA section 7.

Figure 3. General process of Information Exchange and Technical Assistance Between Directors and the Services. Ovals represent start and end points; rectangles represent activities required in the Rule; diamonds represent discretionary activities described in the Rule. Process may be adjusted when warranted for consideration of individual permits.



11.0 Incidental Take Statement

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the “take” of endangered and threatened species, respectively, without special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the USFWS as an act which actually kills or injures wildlife, which may include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the USFWS as actions that create the likelihood of injury to listed species by annoying them to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of sections 7(b)(4) and 7(o)(2), taking that is incidental and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Section 7(b)(4) and 7(o)(2) of the ESA generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the ESA prohibits the removal and reduction to possession of Federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

Amount or Extent of Take Anticipated

While the BE provided an analysis of impacts related to stressors to ESA-listed species, the paucity of information submitted by EPA regarding facilities with CWIS does not allow the Services to identify facility locations, the specific actions of those facilities that may result in take of listed species, the number of individuals that might be taken by those actions, or the proportion of populations of endangered or threatened species these might represent. However, through implementation of the Rule, this information will be provided to the Services. At the appropriate Field Office of the USFWS or Regional Office of NMFS, the Services’ will have the opportunity to review all NPDES permit applications for each facility seeking compliance under 316(b) of the CWA, either during section 7 consultation with EPA or during the technical assistance process for State and Tribal-issued permits identified in the Rule. This affords the Services the opportunity to appropriately evaluate project effects on a site-specific and species-specific basis. This review will allow the Services to provide technical assistance to the State or Tribal Director and the owner/operator to adjust an action that may result in the take of endangered or threatened species. As described in our conclusion, we assume that through technical assistance with the State or Tribal Directors, appropriate control measures to minimize incidental take and detrimental effects associated with the operation of CWIS will be developed by the Services, and that these measures will ensure that each permit will minimize adverse effects and thereby avoid jeopardy to ESA-listed species identified in Tables 2 and 3 and avoid destruction or adverse modification of critical habitat. We also assume Directors will incorporate the Services’ recommendations into NPDES permits that contain 316(b)

requirements. If it is determined, through section 7 consultation with EPA or through technical assistance on individual permits with State or Tribal Directors that take of ESA-listed species is still expected to occur after implementation of recommended control measures, the amount or extent of incidental take will be quantified, at that time by the appropriate Field Office of the USFWS and/or Regional Office of the NMFS.

Incidental take exemption will be afforded to EPA when the Rule, including its implementation process, is carried out as described in this Opinion. In addition, any take incidental to the operation of a CWIS permitted under the Rule through the implementation process described in this Opinion will be exempt from Section 9 and Section 4(d) prohibitions if the owner/operator implements enforceable control measures, monitoring, and reporting as agreed upon by the owner/operator and the Services, and as reflected in the permit.

In summary, because of the large scale and broad scope of the proposed action, even the best scientific and commercial data available are not sufficient to enable the Services to accurately estimate the specific amount of potential incidental take associated with the action at this time. Incidental take of listed species will be quantified during ESA section 7 consultation process for permits issued by EPA or the technical assistance process for State and Tribal-issued permits associated with our review of the 316(b) application for a specific facility. This Incidental Take Statement does not apply in the absence of any take prohibited under Section 9 or Section 4(d) of the ESA.

12.0 Reasonable and Prudent Measures

The following reasonable and prudent measure is necessary and appropriate to minimize impacts of incidental take to species identified in Tables 2 and 3.

1. EPA will use its authorities under the CWA to minimize impacts to listed species pursuant to the 316(b) Rule and CWA.

13.0 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, EPA must comply with the following terms and conditions, which implement the reasonable and prudent measure described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. EPA will ensure the Directors notify both Services and EPA of control measures, monitoring, or reporting recommendations provided by the Services that have been adopted as permit conditions. A copy of the draft permit provided to the Services per 40 CFR 124.10(c)(1) prior to finalization of the permit will satisfy this requirement.
2. EPA will report and provide to the Services:
 - a. an annual report summarizing the facility monitoring data submitted by State Directors to EPA pursuant to 125.98(k), including data on impacts to ESA-listed

- species or critical habitat. If the Director (based on recommendations from the Services during their review of permit applications or draft permits) requires additional reporting per year, then that reporting from the state Director will be provided in addition to the annual summary report. The annual report must summarize any monitoring reports submitted by facilities to state Directors. EPA will provide the compiled raw data to the Services when the State provides such data to EPA. EPA will also seek to provide additional raw data from the Director's summarized reports if requested to do so; and
- b. the annual report must include a table that identifies all ESA-listed species taken by CWIS along with the total number of organisms taken (deaths and injuries) per year at each facility as reported to EPA by the state Director pursuant to 125.98(k).
3. In order to review the effectiveness of the technical assistance process between the Directors and the Services as outlined in the Rule, EPA will report the following to the Services on an annual basis for the first four years following implementation of the Rule. As described in the Rule, data requirements for permit applications may warrant several years of data collection. Therefore, the number of permits issued may increase after the initial four year period. If necessary the Services may subsequently request EPA to report on a semi-annual basis:
 - a. A list of all state permits issued pursuant to 316(b); and
 - b. Of those permits issued pursuant to 316(b), identification of any that were elevated by the Services to an EPA's Regional Office and how those elevations were resolved.
 4. Within 60 days of finalization of the Rule, EPA will provide each State Director an instructional memorandum developed in coordination with the Services detailing the technical assistance process that is to occur between the Services and the Directors. The memorandum will also further explain how Directors are to interpret the various aspects of the Rule, consistent with the April 8, 2014, correspondence from EPA (attached as Appendix A).
 5. Within 60 days of finalization of the Rule, EPA will provide the Services a list of those facilities which are currently operating under administratively continued permits and may be subject to the Rule.
 6. EPA will request Directors reopen any currently administratively continued permit if the Services determine the facility's CWIS operations may have more than minor detrimental effects to federally-listed species or critical habitat.
 7. If incidental take as quantified for an individual facility through the technical assistance process is exceeded, EPA will request the State or Tribal Director reopen the permit to analyze if additional control measures, monitoring, and reporting are necessary to further minimize adverse effects on ESA-listed species.
 8. EPA will inform Directors that pursuant to the Services Consultation Handbook

(1998) if an owner/operator locates dead or injured federally-listed species, immediate notification must be made to the appropriate Field Office of the USFWS and/or Regional Office of the NMFS. Pertinent information including the date, time, location, and possible cause of injury or mortality (e.g. impingement or entrainment) of each species shall be recorded and provided to the Services. Instructions for proper care, handling, transport, and disposition of such specimens will be issued by the Services. Care must be taken in handling sick or injured animals to ensure effective treatment and in handling dead specimens to preserve biological material in the best possible state.

14.0 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We recommend that EPA implement the following actions:

1. In consultation with the Service, develop a conservation program for threatened and endangered species and, in collaboration with States and Tribes, develop conservation plans that specifically addresses threats to listed species and how implementation of CWA programs can ameliorate those threats;
2. .EPA should sponsor additional research and development with industry/facilities/States to support new technological devices or structures to further reduce impingement and entrainment of aquatic organisms.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

15.0 Reinitiation Notice

This concludes formal consultation on the action. As described in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded-for this programmatic consultation, exceedance of take at individual facilities will be addressed as described in term and condition number 7; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. If the assumptions about the process outlined in this Opinion regarding how adverse effects to ESA-listed species and critical habitat will be addressed are not being followed, then this lack of

adherence to the process constitutes new information per reinitiation trigger Number 2. This could be the basis for reinitiating consultation. Examples of how adverse effects will be addressed that are described in this Opinion include the Services' review of permit applications and draft permits, the transmittal by the Services of recommendations to the Director, and EPA's commitment to oversight of State permits to ensure that control measures, monitoring, and reporting recommendations necessary for the protection of ESA-listed species will be included in permits. Through the periodic reviews and reporting required of EPA in terms and conditions numbers 2 and 3, the Services and EPA will be able to identify whether there are deficiencies with the process as analyzed in this Opinion and determine if reinitiation of this consultation is necessary.

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Appendix A

April 8, 2014

Email Correspondence with EPA

Appendix B

Status Information for Species Under Jurisdiction of NMFS

Appendix C

Additional Species Specific Effects Analysis for Species Under Jurisdiction of NMFS

Appendix D

Example of Species Specific Control Measures, Monitoring, and Reporting.