FOR PUBLICATION

UNITED STATES COURT OF APPEALS FOR THE NINTH CIRCUIT

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY; WESTLANDS WATER DISTRICT; STOCKTON EAST WATER DISTRICT; METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA; OAKDALE IRRIGATION DISTRICT; SOUTH SAN JOAQUIN IRRIGATION DISTRICT; KERN COUNTY WATER AGENCY; COALITION FOR A SUSTAINABLE DELTA; STATE WATER CONTRACTORS, *Plaintiffs-Appellees*, CALIFORNIA DEPARTMENT OF WATER RESOURCES, *Intervenor-Plaintiff–Appellee*, v. GARY LOCKE; UNITED STATES DEPARTMENT OF COMMERCE; NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION; NATIONAL MARINE FISHERIES SERVICE; JAMES W. BALSIGER; RODNEY R. MCINNIS; U.S. DEPARTMENT OF THE INTERIOR; UNITED STATES BUREAU OF	No. 12-15144 D.C. No. 1:09-cv-01053-LJO-DLB

RECLAMATION; MICHAEL L. CONNOR; DONALD R. GLASER; JANE LUBCHENCO; SALLY JEWELL,*
Defendants,

and

THE BAY INSTITUTE; CALIFORNIA TROUT; FRIENDS OF THE RIVER; NATURAL RESOURCES DEFENSE COUNCIL; NORTHERN CALIFORNIA COUNCIL OF THE FEDERATION OF FLY FISHERS; SAN FRANCISCO BAYKEEPER; SACRAMENTO RIVER PRESERVATION TRUST; WINNEMEM WINTU TRIBE; PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, INC., Institute for Fisheries Research,
Intervenor-Defendants–Appellants.

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY; WESTLANDS WATER DISTRICT,
Plaintiffs-Appellants,

and

No. 12-15289

D.C. No. 1:09-cv-01053-LJO-DLB

* Sally Jewell is substituted for her predecessor, Kenneth Lee Salazar, as Secretary of the Interior. Fed. R. App. P. 43(c)(2).

STOCKTON EAST WATER DISTRICT; METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA; OAKDALE IRRIGATION DISTRICT; SOUTH SAN JOAQUIN IRRIGATION DISTRICT; KERN COUNTY WATER AGENCY; COALITION FOR A SUSTAINABLE DELTA; STATE WATER CONTRACTORS,

Plaintiffs,

CALIFORNIA DEPARTMENT OF WATER RESOURCES,

Intervenor-Plaintiff,

v.

GARY LOCKE; UNITED STATES DEPARTMENT OF COMMERCE; NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION; NATIONAL MARINE FISHERIES SERVICE; JAMES W. BALSIGER; RODNEY R. MCINNIS; U.S. DEPARTMENT OF THE INTERIOR; UNITED STATES BUREAU OF RECLAMATION; MICHAEL L. CONNOR; DONALD R. GLASER; JANE LUBCHENCO; SALLY JEWELL,

Defendants-Appellees,

THE BAY INSTITUTE; CALIFORNIA TROUT; FRIENDS OF THE RIVER;

NATURAL RESOURCES DEFENSE COUNCIL; NORTHERN CALIFORNIA COUNCIL OF THE FEDERATION OF FLY FISHERS; SAN FRANCISCO BAYKEEPER; SACRAMENTO RIVER PRESERVATION TRUST; WINNEMEM WINTU TRIBE; PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, INC., Institute for Fisheries Research,

Intervenor-Defendants–Appellees.

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY; WESTLANDS WATER DISTRICT; STOCKTON EAST WATER DISTRICT; METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA; OAKDALE IRRIGATION DISTRICT; SOUTH SAN JOAQUIN IRRIGATION DISTRICT; KERN COUNTY WATER AGENCY; COALITION FOR A SUSTAINABLE DELTA,

Plaintiffs,

CALIFORNIA DEPARTMENT OF WATER RESOURCES,

Intervenor-Plaintiff,

and

No. 12-15290

D.C. No. 1:09-cv-01053-LJO-DLB

STATE WATER CONTRACTORS,
Plaintiff-Appellant,

v.

GARY LOCKE; UNITED STATES DEPARTMENT OF COMMERCE; NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION; NATIONAL MARINE FISHERIES SERVICE; JAMES W. BALSIGER; RODNEY R. MCINNIS; U.S. DEPARTMENT OF THE INTERIOR; UNITED STATES BUREAU OF RECLAMATION; MICHAEL L. CONNOR; DONALD R. GLASER; JANE LUBCHENCO; SALLY JEWELL,
Defendants-Appellees,

THE BAY INSTITUTE; CALIFORNIA TROUT; FRIENDS OF THE RIVER; NATURAL RESOURCES DEFENSE COUNCIL; NORTHERN CALIFORNIA COUNCIL OF THE FEDERATION OF FLY FISHERS; SAN FRANCISCO BAYKEEPER; SACRAMENTO RIVER PRESERVATION TRUST; WINNEMEM WINTU TRIBE; PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, INC., Institute for Fisheries Research,
Intervenor-Defendants–Appellees.

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY; WESTLANDS WATER DISTRICT; STOCKTON EAST WATER DISTRICT; METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA; OAKDALE IRRIGATION DISTRICT; SOUTH SAN JOAQUIN IRRIGATION DISTRICT; STATE WATER CONTRACTORS, *Plaintiffs*, CALIFORNIA DEPARTMENT OF WATER RESOURCES, *Intervenor-Plaintiff*, and KERN COUNTY WATER AGENCY; COALITION FOR A SUSTAINABLE DELTA, *Plaintiffs-Appellants*, v. GARY LOCKE; UNITED STATES DEPARTMENT OF COMMERCE; NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION; NATIONAL MARINE FISHERIES SERVICE; JAMES W. BALSIGER; RODNEY R. MCINNIS; U.S. DEPARTMENT OF THE INTERIOR; UNITED STATES BUREAU OF	No. 12-15291 D.C. No. 1:09-cv-01053-LJO-DLB

RECLAMATION; MICHAEL L. CONNOR; DONALD R. GLASER; JANE LUBCHENCO; SALLY JEWELL,
Defendants-Appellees,

THE BAY INSTITUTE; CALIFORNIA TROUT; FRIENDS OF THE RIVER; NATURAL RESOURCES DEFENSE COUNCIL; NORTHERN CALIFORNIA COUNCIL OF THE FEDERATION OF FLY FISHERS; SAN FRANCISCO BAYKEEPER; SACRAMENTO RIVER PRESERVATION TRUST; WINNEMEM WINTU TRIBE; PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, INC., Institute for Fisheries Research,
Intervenor-Defendants–Appellees.

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY; WESTLANDS WATER DISTRICT; STOCKTON EAST WATER DISTRICT; OAKDALE IRRIGATION DISTRICT; SOUTH SAN JOAQUIN IRRIGATION DISTRICT; STATE WATER CONTRACTORS; KERN COUNTY WATER AGENCY; COALITION FOR A SUSTAINABLE DELTA,
Plaintiffs,

No. 12-15293

D.C. No. 1:09-cv-01053-LJO-DLB

CALIFORNIA DEPARTMENT OF WATER RESOURCES,
Intervenor-Plaintiff,

and

METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA,
Plaintiff-Appellant,

v.

GARY LOCKE; UNITED STATES DEPARTMENT OF COMMERCE; NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION; NATIONAL MARINE FISHERIES SERVICE; JAMES W. BALSIGER; RODNEY R. MCINNIS; U.S. DEPARTMENT OF THE INTERIOR; UNITED STATES BUREAU OF RECLAMATION; MICHAEL L. CONNOR; DONALD R. GLASER; JANE LUBCHENCO; SALLY JEWELL,
Defendants-Appellees,

THE BAY INSTITUTE; CALIFORNIA TROUT; FRIENDS OF THE RIVER; NATURAL RESOURCES DEFENSE COUNCIL; NORTHERN CALIFORNIA COUNCIL OF THE FEDERATION OF FLY FISHERS; SAN FRANCISCO BAYKEEPER; SACRAMENTO RIVER

PRESERVATION TRUST; WINNEMEM WINTU TRIBE; PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, INC., Institute for Fisheries Research,
Intervenor-Defendants–Appellees.

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY; WESTLANDS WATER DISTRICT; STOCKTON EAST WATER DISTRICT; METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA; OAKDALE IRRIGATION DISTRICT; SOUTH SAN JOAQUIN IRRIGATION DISTRICT; KERN COUNTY WATER AGENCY; COALITION FOR A SUSTAINABLE DELTA; STATE WATER CONTRACTORS,
Plaintiffs-Appellees,

CALIFORNIA DEPARTMENT OF WATER RESOURCES,
Intervenor-Plaintiff–Appellee,

v.

GARY LOCKE; UNITED STATES DEPARTMENT OF COMMERCE; NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION; NATIONAL MARINE FISHERIES

No. 12-15296

D.C. No. 1:09-cv-01053-LJO-DLB

OPINION

SERVICE; JAMES W. BALSIGER; RODNEY R. MCINNIS; U.S. DEPARTMENT OF THE INTERIOR; UNITED STATES BUREAU OF RECLAMATION; MICHAEL L. CONNOR; DONALD R. GLASER; JANE LUBCHENCO; SALLY JEWELL,
Defendants-Appellants,

and

THE BAY INSTITUTE; CALIFORNIA TROUT; FRIENDS OF THE RIVER; NATURAL RESOURCES DEFENSE COUNCIL; NORTHERN CALIFORNIA COUNCIL OF THE FEDERATION OF FLY FISHERS; SAN FRANCISCO BAYKEEPER; SACRAMENTO RIVER PRESERVATION TRUST; WINNEMEM WINTU TRIBE; PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS, INC., Institute for Fisheries Research,
Intervenor-Defendants.

Appeal from the United States District Court
for the Eastern District of California
Oliver W. Wanger, District Judge, Presiding

Argued and Submitted
September 15, 2014—San Francisco, California

Filed December 22, 2014

Before: Richard C. Tallman and Johnnie B. Rawlinson, Circuit Judges, and Thomas O. Rice, District Judge.[**]

Opinion by Judge Tallman

SUMMARY[***]

Endangered Species Act

The panel affirmed in part and reversed in part the district court's summary judgment and remanded for entry of summary judgment in favor of defendants, federal agencies and intervenor-environmental groups, in an action pertaining to a formal Biological Opinion developed by the Commerce Department's National Marine Fisheries Service pursuant to the Endangered Species Act regarding the impact of continuing water extraction in the California Central Valley on certain threatened and endangered Salmonid species.

The Marine Fisheries Service in its 2009 Biological Opinion determined that the Department of Interior Bureau of Reclamation's proposed water project in the Central Valley would jeopardize some of the Delta's endangered Salmonids. To remedy this problem, the Marine Fisheries Service

[**] The Honorable Thomas O. Rice, United States District Judge for the Eastern District of Washington, sitting by designation.

[***] This summary constitutes no part of the opinion of the court. It has been prepared by court staff for the convenience of the reader.

required the Bureau to change the way it pumps water out of the Central Valley's rivers. A number of groups that depend on the Central Valley's water sued to halt this change. On summary judgment, the district court found, in part, that the Marine Fisheries Service violated the Administrative Procedure Act's arbitrary or capricious standard when developing much of the Biological Opinion.

On an initial evidentiary question, the panel held that the district court went beyond the exceptions, set forth in *Lands Council v. Powell*, 395 F.3d 1019 (9th Cir. 2004), when it admitted extra-record declarations and substituted the analysis in those declarations for that provided by the Marine Fisheries Service.

The panel held that the district court did not give the Service the substantial deference it was due under the Administrative Procedure Act. The panel found that the components of the Biological Opinion invalidated by the district court were reasonable and supported by the record and therefore the panel upheld the Biological Opinion in its entirety.

Specifically, the panel found that: (1) the Service acted within its substantial discretion when it used raw salvage data instead of data scaled to fish population to set flows in the Old and Middle Rivers; (2) the Service's jeopardy opinion components were not arbitrary and capricious as they pertained to the winter-run Chinook, the Southern Resident orca, the steelhead critical habitat, and the impact of indirect mortality factors on the listed species; and (3) the Biological Opinion's challenged reasonable and prudent alternative actions were not arbitrary and capricious.

Affirming, on cross-appeal, several components of the district court's opinion, the panel held that the Marine Fisheries Service did not need to distinguish between discretionary and non-discretionary actions; that the Biological Opinion's indirect mortality factors were direct effects under the Endangered Species Act; and that Bureau of Reclamation was not independently liable under the Endangered Species Act.

COUNSEL

Rebecca Rose Akroyd, Daniel J. O'Hanlon, Hanspeter Walter, Kronick, Moskovitz, Tiedemann, & Girard, PC, Sacramento, California, for Plaintiffs-Appellees/Cross-Appellants San Luis & Delta-Mendota Water Authority and Westlands Water District.

David A. Diepenbrock, Eileen Diepenbrock, Jonathan Marz, and Jon D. Rubin, Diepenbrock Elkin LLP, Sacramento, California, for Plaintiffs-Appellees San Luis & Delta-Mendota Water Authority.

Robert D. Thornton and Paul S. Weiland, Nossaman LLP, Irvine, California, for Plaintiff-Appellee/Cross-Appellant Kern County Water Agency and Plaintiff-Appellee Coalition for a Sustainable Delta.

Amelia T. Minaberrigarai, General Counsel, Bakersfield, California, for Plaintiff-Appellee/Cross-Appellant Kern County Water Agency.

Martha F. Bauer, Mark J. Mathews, Brownstein Hyatt Farber Schreck, LLP, Denver, Colorado; Steve Sims, Brownstein

Hyatt Farber Schreck, LLP, Albuquerque, New Mexico; David Longly Bernhardt (argued), Brownstein Hyatt Farber Schreck, LLP, Washington, D.C.; Harold Craig Manson, General Counsel, Fresno, California, for Plaintiff-Appellee/Cross-Appellant Westlands Water District.

Tim O'Laughlin and William C. Paris, III, O'Laughlin & Paris LLP, for Plaintiffs-Appellees Oakdale Irrigation District and South San Joaquin Irrigation District.

Steven M. Anderson, Melissa R. Cushman, Steven G. Martin, and Gregory K. Wilkinson, Best Best & Krieger, LLP, Riverside, California; Paeter E. Garcia, Best Best & Krieger LLP, Los Angeles, California, for Plaintiffs-Appellees State Water Contractors.

Alexis K. Galbraith, Karna Elizabeth Harrigfeld, Jennifer Lynn Spaletta, and Jeanne M. Zolezzi, Herum Crabtree, Stockton, California, for Plaintiff-Appellee Stockton East Water District.

Christopher J. Carr and William M. Sloan (argued), Morrison & Foerster LLP, San Francisco, California; Linus Masouredis, Chief Deputy General Counsel, Sacramento, California, for Plaintiff-Appellee Metropolitan Water District of Southern California.

Michael M. Edson, Allison Goldsmith, Daniel S. Harris, Clifford T. Lee (argued), Deputy Attorneys General—Office of the California Attorney General, San Francisco, California, for Intervenor-Plaintiff–Appellee California Department of Water Resources.

Ellen J. Durkee (argued) and Bridget McNeil, United States Department of Justice, Washington, D.C., for Defendants-Appellants/Cross-Appellees United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, United States Department of the Interior, and United States Bureau of Reclamation.

Trent W. Orr and George Matthew Torgun, Earthjustice, San Francisco, California, for Intervenor-Defendants–Appellants/ Cross-Appellees Pacific Coast Federation of Fisherman's Associations, Institute for Fisheries Research, The Bay Institute, California Trout, Friends of the River, Northern California Counsel of the Federation of Fly Fishers, San Francisco Baykeeper, Sacramento River Preservation Trust, Winnemem Wintu Tribe.

Katherine S. Poole (argued) and Douglas A. Obegi, San Francisco, California, for Intervenor-Defendant/Appellant Natural Resources Defense Counsel.

TABLE OF CONTENTS

I. FACTS AND PROCEEDINGS BELOW. 23

A. Background. 23

1. Factual Background—The Sacramento-San Joaquin Delta. 23

a. The Central Valley and the River Systems. 23

b. The State Water Project and the Central Valley Project. 25

c. Threatened and Endangered Species in the Delta. 28

2. Legal Background—The Endangered Species Act.. 30

B. Proceedings Leading to the Current Controversy 32

1. The 2009 Salmonid Biological Opinion 32

a. The Consultation Request. . . . 32

b. The Jeopardy Opinion. 33

c. The Reasonable and Prudent Alternatives. 34

2. The Present Case. 35

II. STANDARDS OF REVIEW. 39

III. THE RECORD ON REVIEW. 40

IV. THE LEGAL FRAMEWORK.. 44

A. The APA. 44

B. The ESA.. 46

V. THE MERITS OF THE BIOLOGICAL OPINION. . . 47

A. We Defer To the Agency's Choice To Use Raw Salvage Figures. 49

B. The Challenged Jeopardy Opinion Components Are Not Arbitrary or Capricious. 52

1. Winter-Run Chinook. 52

2. Southern Resident Orca. 53

3. Steelhead Critical Habitat. 55

4. Indirect Mortality Factors. 57

C. The Challenged RPA Actions Are Not Arbitrary or Capricious. 60

1. The Legal Requirements for an RPA Action.. 60

a. The ESA Does Not Require NMFS To Explain How Each RPA Action Is Essential To Avoid Jeopardy. 62

b. The ESA Does Not Require NMFS To Articulate Compliance with the Non-Jeopardy Factors 63

2. Challenged RPA Actions. 64

a. Action IV.2.1. 64

b. Action IV.2.3 and Action IV.3 66

c. Action IV.4.2. 68

d. Action III.1.2. 69

e. Action III.1.3. 71

f. Action III.2.2. 73

VI. CROSS-APPEAL. 74

A. NMFS Need Not Distinguish Discretionary and Non-Discretionary Actions. 74

B. The Biological Opinion's Indirect Mortality Factors Are Direct Effects Under the ESA. . . 75

C. Reclamation Is Not Independently Liable Under the ESA. 77

VII. CONCLUSIONS. 77

GLOSSARY OF TERMS. 79

OPINION

TALLMAN, Circuit Judge:

> And then the dry years would come, and sometimes there would be only seven or eight inches of rain. The land dried up and the grasses headed out miserably a few inches high and great bare scabby places appeared in the valley. The live oaks got a crusty look and the sage-brush was gray. The land cracked and the sprigs dried up and the cattle listlessly nibbled dry twigs. Then the farmers and the ranchers would be filled with disgust for the Salinas Valley. The cows would grow thin and sometimes starve to death. People would have to haul water in barrels to their farms just for drinking.

John Steinbeck, *East of Eden* 5 (Penguin Books 2002) (1952).

Although John Steinbeck wrote about California's Salinas Valley, the same can be said for California's Central Valley. Like the Salinas Valley, the Central Valley is rich and fertile. It is home to some of California's most productive agriculture, and food grown in the Valley sits on the tables in most American homes. But the Central Valley is also naturally dry. The Valley floor receives an average of five to sixteen inches of rainfall per year; the United States Geological Service considers it to be arid or semi-arid. In its natural state, the Valley could not sustain the level of agriculture that the country demands from it.

To remedy this problem, the federal and state governments have invested enormous sums of money developing infrastructure to pump water out of the rivers that crisscross the Valley's floor, store it, and deliver it to agricultural and domestic consumers in California. This water is essential to the continuing vitality of agriculture in the Central Valley, and some 25 million Californians depend on it for daily living. But that water is also an important habitat for thousands of river and anadromous fish, many of which are endangered.

And therein lies the conflict: If the governments did not extract water from the Central Valley's rivers, the Valley could not support the farms that feed, the dams that power, and the canals that hydrate millions of Americans. But by extracting the water, people dramatically alter the rivers' natural state and threaten the viability of the species that depend on them. People need water, but so do fish.

This case is about the competing demands for these limited water resources. In 2006 the Department of Interior's Bureau of Reclamation ("Reclamation"), the federal agency that oversees water resources in the West, asked the Commerce Department's National Marine Fisheries Service ("NMFS") to evaluate under the Endangered Species Act ("ESA") the impact of continuing water extraction in the Central Valley on certain threatened and endangered Salmonid species that live there. In response, NMFS developed a Biological Opinion ("BiOp") in which it determined that Reclamation's proposed project would jeopardize some of the Delta's endangered Salmonids. *See generally* 2009 Salmonid BiOp at 574–75. To remedy this problem, NMFS required Reclamation to change the way it pumps water out of the Valley's rivers. *See id.* at ch. 11. A

number of groups that depend on the Central Valley's water sued to halt this change. On summary judgment, the district court found that NMFS had violated the Administrative Procedure Act's ("APA") arbitrary or capricious standard when developing much of the BiOp. *See generally In re Consolidated Salmonid Cases*, 791 F. Supp. 2d 802, 955–59 (E.D. Cal. 2011); 5 U.S.C. § 706(2)(a) (2012). Defendants—joined by environmental groups—appealed, and once again we enter the fray.[1]

We hold that the district court did not give NMFS the substantial deference it is due under the APA. On independent record review, we find that the components of the BiOp invalidated by the district court are reasonable and supported by the record. As a result, we uphold the BiOp in its entirety. We, therefore, REVERSE and REMAND for entry of summary judgment in favor of Defendants.

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[1] This is not the first time we have addressed this conflict, nor is it likely to be the last. We recently addressed the conflict between Delta irrigation and a small threatened fish known as the Delta Smelt. *See San Luis & Delta Mendota Water Auth. v. Jewell* (*Delta Smelt*), 747 F.3d 581 (9th Cir. 2014). In *Delta Smelt* we reversed the district court and upheld a 2008 BiOp in which the Fish and Wildlife Service ("FWS") concludes that continued water extraction from the Central Valley's rivers would jeopardize the Delta Smelt and offers reasonable and prudent alternatives that Reclamation should take to ameliorate this impact. *See id.* at 593–92. Our opinion in *Delta Smelt* informs much of our analysis here.

I. FACTS AND PROCEEDINGS BELOW

A. Background

1. Factual Background—The Sacramento-San Joaquin Delta

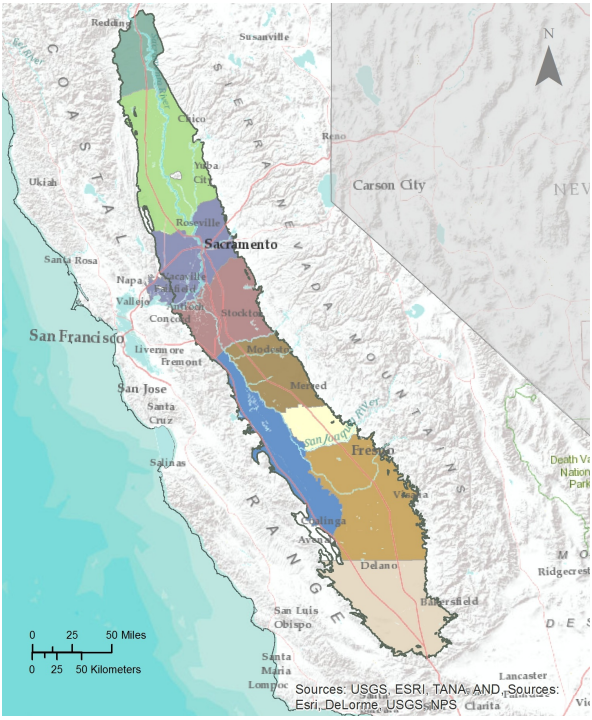
a. The Central Valley and the River Systems

The Central Valley is a flat-bottom basin covering 22,500 square miles in inland California. The walls of the basin are created by several mountain ranges: the Sierra Nevada and Cascade Mountains to the east, the Klamath Mountains to the north, the Coast Range to the west, and the Tehachapi Mountains to the south. *See infra*, Fig. A. The Valley is long and narrow. It stretches from Bakersfield in the south to Redding in the north (about 450 miles) and is between 40 and 60 miles wide from east to west.

The Central Valley contains several major river systems. Those systems are comprised of the San Joaquin River (which flows west from the Cathedral Range of the Sierra Nevada Mountains, turns north around Fresno, and enters the San Francisco Bay north of Berkeley), the Sacramento River (which flows south from the Salmon and Trinity Mountains around Redding and passes through Sacramento before joining the San Joaquin River), and their tributaries. The Sacramento and San Joaquin Rivers converge around Antioch, about thirty miles northeast of Oakland, where they form the San Joaquin River Delta. The water from the Delta flows past Chipps Island, into the Suisun Bay, through Bulls Head Channel, and into the San Francisco Bay. The water passes the city of San Francisco and flows under the Golden Gate Bridge where it finally enters the Pacific Ocean. *See*

infra, Fig. A. The brackish body of water through which the rivers flow on their way to the Pacific Ocean is called the "Bay-Delta." The river delta is called simply "the Delta."

Fig. A. Delta Map.[2]



[2] *California Water Science Center*, U.S. Geological Survey, http://ca.water.usgs.gov/gama/Provs/CenVly.htm (last visited Oct. 21, 2014, 9:09 a.m.).

b. The State Water Project and the Central Valley Project

Since the early part of the twentieth century, land owners, local irrigation districts, and the federal and California state governments have pumped fresh water out of the San Joaquin and Sacramento Rivers (and their tributaries) to irrigate the agricultural lands of the Central Valley and to provide drinking water to the people of California. *See Cent. Delta Water Agency v. United States*, 306 F.3d 938, 943 (9th Cir. 2002). California governs this pumping through the State Water Project ("SWP") and the federal government does so through the Central Valley Project ("CVP") (collectively, "the Projects").

The SWP is the largest state-built water project in the United States. *Delta Smelt*, 747 F.3d at 594. It consists of "21 dams and reservoirs, . . . five power plants, 16 pumping plants, and 662 miles of aqueduct." *Id.* (internal citations omitted). The California Department of Water Resources ("DWR")—Plaintiff-in-Intervention here—oversees operations of the SWP. *Id.*

The CVP is "the largest federal water management project in the United States." *Cent. Delta Water Agency*, 306 F.3d at 943. Congress initially authorized it in the Rivers and Harbors Act of 1935. *Id.* It comprises a series of dams, "21 reservoirs, 11 hydropower plants, and 500 miles of canals and aqueducts." *Delta Smelt*, 747 F.3d at 594. Reclamation oversees operations of the CVP. The CVP is partially governed by the Central Valley Project Improvement Act ("CVPIA"), *id.* at 594, which Congress passed in 1992 to "achieve a reasonable balance among competing demands for use of Central Valley Project water, including the

requirements of fish and wildlife, agricultural, municipal and industrial and power contractors." Central Valley Project Improvement Act, Pub L. No. 102–575, 106 Stat. 4706 (1992).

Together, the Projects provide water to more than 25 million agricultural and domestic consumers in central and southern California. They do so, in part, by pumping fresh water out of the Delta using the Harvey O. Banks Pumping Plant ("Banks pumping plant") and the C.W. "Bill" Jones Pumping Plant ("Jones pumping plant"), both of which are located near Tracy, California.[3] The Banks pumping plant is capable of pumping water at the rate of 10,300 cubic feet per second ("cfs"), but it generally operates closer to 6,680 cfs. *See* OCAP BA at 2-2. The Jones pumping plant has a maximum pumping capability of 4,600 cfs. *See id.* The plants operate by lifting water from the Delta using motor-generated pumps.[4] They pump the water into pipes that deliver it into the California Aqueduct or the Delta-Mendota Canal, respectively. *See* Jones & Banks Pumping Facilities. From there, the Projects deliver the water to agricultural users in the Central Valley and domestic users in central and southern California. *See id.*; *see also* Fig. B.

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[3] *See Biological Assessment on the Continued Long-term Operations of the Central Valley Project and the State Water Project*, U.S. Bureau of Reclamation, http://www.usbr.gov/mp/cvo/ocapBA_051608.html 2-1 (last visited Oct. 20, 2014) [hereinafter "OCAP BA"]; *see also* Fig. A.

[4] *Central Valley Project's C.W. "Bill" Jones Pumping Plant and Tracy Fish Collection Facility*, U.S. Bureau of Reclamation (July 2012), http://www.usbr.gov/mp/PA/docs/fact_sheets/Jones_Pumping_Plant.pdf [hereinafter "Jones and Banks Pumping Facilities"].

The Projects also control the volume of water flowing through the Central Valley's rivers by prescribing releases from upstream reservoirs, which operate as water storage facilities. Releases from CVP/SWP reservoirs cool water temperatures, reduce the salinity of the Delta, provide flood control, improve volume for fish habitat and migration, and supply additional water for agricultural use. *See* OCAP BA at 2-5.

Fig. B. CVP and SWP Map.[5]

[5] *Central Valley Project*, U.S. Bureau of Reclamation, http://www.usbr.gov/projects/Project.jsp?proj_Name=Central+Valley+Project (last visited Oct. 21, 2014 8:55 a.m.); James Nickles et al., California's BAY-DELTA: USGS Science Supports Decision Making, http://pubs.usgs.gov/fs/2010/3032/ (last visited Oct. 21, 2014, 9:00 a.m.).

c. Threatened and Endangered Species in the Delta

Although the Projects provide substantial benefits to people and to state agriculture, they arguably harm species native to the Delta by modifying those species' natural habitats. Five such species are at issue in this case: (1) the endangered Sacramento River winter-run Chinook salmon ("winter-run Chinook"); (2) the threatened Central Valley spring-run Chinook salmon ("spring-run Chinook"); (3) the threatened Central Valley steelhead ("CV steelhead"); (4) the threatened Southern Distinct Population Segment of North American green sturgeon ("green sturgeon"); and the endangered Southern Resident orca whale ("Southern Resident orca"). *See* 2009 Salmonid BiOp at 30.

The four Salmonid species (the first four listed) are anadromous fish, and Southern Resident orca are marine mammals. Anadromous fish live most of their lives in salt water.[6] Nevertheless, they are born, mature, lay eggs, and often die in inland freshwater lakes and rivers. After they grow from fry (baby fish) to smolts (juvenile fish) in fresh water, anadromous salmon outmigrate through rivers and deltas into the oceans and seas where they will spend most of their adult lives. When it is time to reproduce, these salmon migrate back through the deltas to the rivers and lakes in which they were born to lay eggs. During this migration, salmon must pass impediments in inland rivers such as locks, dams, channels, and pumps.

The San Francisco Bay-Delta is an essential conduit for anadromous fish that return to California's inland rivers and lakes to reproduce. Nevertheless, human interactions with the Delta and California's inland rivers over the past century have significantly altered them, threatening their ability to serve as salmonid habitats. SWP and CVP operations increase pollution, encourage the growth of non-native species, and create water shortages in the Delta that harm salmon by exposing them to unnatural stressors. *See* 2009 Salmonid BiOp at 374–82. Migrating salmon can also be caught in, and killed by, the large water pumps that serve the Projects. Finally, CVP/SWP operations that limit cold water releases from dams upstream of traditional spawning sites potentially impact critical spawning habitat by making the rivers less conducive to reproduction.

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[6] *See, e.g.*, *Chinook Salmon (Oncorhynchus tshawytscha)*, NOAA Fisheries Office of Protected Resources, http://www.nmfs.noaa.gov/pr/species/fish/chinooksalmon.htm (last updated May 15, 2014).

2. Legal Background—The Endangered Species Act

We must review NMFS's formal opinion as to how Reclamation and DWR should operate the Projects to avoid jeopardizing endangered Salmonid species. Before further discussing the relationship between the Projects and the species, we briefly review the legal framework for that opinion.

The federal government protects listed and threatened species, such as the five at issue here, primarily through the ESA. *See* Endangered Species Act, 16 U.S.C. §§ 1531–1544 (2012). When Congress passed the ESA in 1973, it sought to bring about the "better safeguarding, for the benefit of all citizens, [of] the Nation's heritage in fish, wildlife, and plants." *Id.* § 1531(a)(5).

Section 7 of the ESA "addresses the obligations of federal agencies with respect to conservation and protection of species listed as either endangered or threatened under the ESA." Lawrence R. Liebesman & Rafe Petersen, *Endangered Species Deskbook* 39 (2d ed. 2010). ESA section 7 prohibits a federal agency from taking any action that is "likely to jeopardize the continued existence" of any listed or threatened species or "result in the destruction or adverse modification" of those species' critical habitat. 16 U.S.C. § 1536(a)(2).

Section 7 requires an agency proposing a project that might harm listed or threatened species to consult with either NMFS or the Interior Department's Fish and Wildlife Service

("FWS")[7] about the proposed action. 16 U.S.C. § 1536(a)(2). As part of this consultation, the action agency prepares an initial assessment of the project in which it evaluates the project's impact on any listed or endangered species. This is called a Biological Assessment ("BA"). 50 C.F.R. § 402.02 (2009). The appropriate consultation agency reviews the action agency's BA and uses it to prepare a Biological Opinion ("BiOp") in which it ultimately determines whether the proposed agency action is likely to adversely impact endangered or listed species, or negatively modify their critical habitats. *See* 16 U.S.C. § 1536(a)(2).[8]

If the agency concludes that the proposed action will jeopardize species or critical habitats, "the Biological Opinion must outline any 'reasonable and prudent alternatives' that the [agency] . . . believes will avoid that consequence." *Bennett v. Spear*, 520 U.S. 154, 158, 117 S. Ct. 1154, 1159 (1997) (quoting 16 U.S.C. § 1536(b)(3)(A)). Reasonable and prudent alternatives ("RPAs") are

> alternative actions identified during formal consultation that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the Federal

[7] Whether an agency consults with NMFS or FWS depends on the species for which it is seeking consultation. NMFS consults on marine and anadromous species. *See* Liebesman & Petersen, *supra*, at 40.

[8] The consultation agency's determination with regard to whether the proposed project is likely to jeopardize listed species is called the "jeopardy opinion" component of the BiOp. *See* U.S. Fish & Wildlife Serv. & Nat' l Marine Fisheries Serv., *ESA Section 7 Consultation Handbook* 4-37 (Mar. 1998) [hereinafter "Handbook"].

> agency's legal authority and jurisdiction, that is [sic] economically and technologically feasible, and that the Director believes would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat.

50 C.F.R. § 402.02. The consulting agency may also issue—with the BiOp—an incidental take statement ("ITS") that permits the action agency to harm listed species when implementing the RPAs without violating the ESA. *See id.*

B. Proceedings Leading to the Current Controversy

1. The 2009 Salmonid Biological Opinion

a. The Consultation Request

In 2006, Reclamation asked NMFS to prepare a BiOp assessing the impact of continued and future CVP/SWP operations on Delta Salmonid species.[9] This request was motivated by the listing of new endangered species and the designation of new critical habitats. 2009 Salmonid BiOp at 31. In it, Reclamation asked NMFS to evaluate the effect of Reclamation and DWR's proposal to continue to operate the Projects "to divert, store, and convey Project water . . . ," OCAP BA at 2-1, on winter-run Chinook, spring-run Chinook, CV steelhead, CCC steelhead (a fish not at issue

[9] Although the SWP is a state project, it is subject to federal consultation along with the CVP because of a 1986 agreement between the federal government and DWR. 2009 Salmonid BiOp at 31.

here), green sturgeon, and Southern Resident orca, *see* 2009 Salmonid BiOp at 30.

Reclamation developed a BA that could provide the basis for such a consultation in the fall of 2008. *Id.* at 32. Using the data Reclamation provided in the BA, supplementing it with its own research, NMFS developed a draft Salmonid BiOp that it released to Reclamation and DWR for comment in the winter of 2008. *Id.* at 33. Reclamation and DWR reviewed and commented on the document. NMFS also requested and received peer review from the CALFED Bay-Delta Program and the Center for Independent Experts. *See id.* Based on the comments received, NMFS published a final 560-page BiOp on June 4, 2009. Reclamation provisionally accepted the BiOp that same day.

Plaintiffs contest the legality of the 2009 BiOp here, arguing—for various reasons—that parts of it are arbitrary or capricious in violation of the APA. Before discussing Plaintiffs' specific challenges and the issues on appeal, we briefly review the portions of the BiOp that are relevant.

b. The Jeopardy Opinion

In the first part of the BiOp, NMFS concludes that "the long-term operations of the CVP and SWP are likely to jeopardize the continued existence of the" winter-run Chinook, the spring-run Chinook, the CV steelhead, the green sturgeon, and the Southern Resident orca. *Id.* at 575. Similarly, "[t]he long-term operations of the CVP and SWP are likely to destroy or adversely modify critical habitat for" winter-run Chinook, spring-run Chinook, CV steelhead, and green sturgeon. *Id.*

c. The Reasonable and Prudent Alternatives

Because NMFS concludes that ongoing CVP/SWP operations would threaten listed species, it issued over seventy RPAs that Reclamation is supposed to implement to avoid jeopardy. *See generally id.* at 574–724. The proposed RPAs fall into five operational categories—(I) Sacramento River Division, (II) American River Division, (III) East Side Division, (IV) Delta Division, and (V) Fish Passage Program. *See id.* at 19. On appeal, the parties challenge provisions of the RPAs falling into categories III and IV.

Actions in category III relate to CVP/SWP operations on the Stanislaus River, which provides critical spawning and smolting grounds for the CV steelhead. *See id.* at 619–20. Prior to the construction of the New Melones Dam on the Stanislaus River, CV steelhead spawned in the cold tributaries upstream of where the New Melones Reservoir is now located. *See id.* at 107–08, 619. Now, "[t]he steelhead population on the Stanislaus River is precariously small and limited to habitat areas below the [Goodwin and New Melones] Dams that historically were unsuitable owing to high summer temperatures." *Id.* at 619. In RPA category III, NMFS prescribes certain volumes of releases from the Goodwin and New Melones Dams that, according to NMFS, will cool the rivers enough to facilitate steelhead spawning. *See id.* at 620. The flows will also rejuvenate the gravel that is essential to steelhead spawning habitat and provide migratory cues to adult and juvenile fish.

Actions in category IV relate to operations in the Delta. *See id.* at 628–30 (describing Delta division action). NMFS concludes that the proposed actions for the Projects, which "include continued diversion of water from the Delta at the

project's export facilities, with increased export levels," "will increase the level of stressors in the Delta," further degrading it as a habitat. *Id.* at 629. The category IV RPA Actions address this jeopardy finding by imposing flow-to-export ratios for the Old and Middle Rivers, *see id.* at 643–44, prescribing maximum negative flow rates for the Old and Middle Rivers, *id.* at 648, and requiring a certain salvage efficiency at major fish salvage stations, *id.* at 655.

2. The Present Case

On June 15, 2009, Plaintiffs San Luis & Delta-Mendota Water Authority and Westlands Water District challenged the legality of the 2009 BiOp by filing suit against the Department of Commerce, the National Oceanic and Atmospheric Administration, and NMFS (collectively "Federal Defendants")[10] in the Eastern District of California. *See* Compl. at 1, ECF No. 1. The district court consolidated that case with several other cases in which state water districts challenged the 2009 BiOp.[11] DWR intervened as a plaintiff. *See* Joinder by Calif. Dep't of Water Res., ECF No. 137. And several environmental and fishing groups

[10] Reclamation and the United States Department of the Interior were later joined. They are included under the umbrella of "Federal Defendants." *See In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 813.

[11] The plaintiffs fall into three separate groups. The **Export Plaintiffs** are San Luis & Delta Mendota Water Authority and Westlands Water District; State Water Contractors; Kern County Water Agency and Coalition for a Sustainable Delta; and Metropolitan Water District of Southern California. The **Stanislaus River Plaintiffs** (or "SR Plaintiffs") are Stockton East Water District, Oakdale Irrigation District, and South San Joaquin Irrigation District. The **DWR Plaintiff in Intervention** is the California Department of Water Resources.

intervened as defendants.[12] *See In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 813.

On August 6, 2010, several Plaintiffs moved for summary judgment on their claim that the 2009 BiOp violates the ESA and the APA. *Id.* The Stanislaus River Plaintiffs and DWR filed separate motions for summary judgment. *Id.* The Federal Defendants and Defendant-Intervenors responded with cross-motions for summary judgment. *Id.* "These cross-motions, which included over 700 pages of briefing and thousands of pages of supporting declarations and exhibits, came on for hearing on December 16 and 17, 2010." *Id.* On September 20, 2011, the district court filed a 157-page opinion granting in part and denying in part Plaintiffs' claims, and granting in part and denying in part Defendants' claims. *Id.* at 955–59.

The district court made dozens of conclusions relating to almost every component of the BiOp when rendering this complex and lengthy opinion. We briefly review the conclusions at issue in this appeal.

The Defendants ask us to overturn the following of the district court's holdings in which it struck down components of the BiOp:

- NMFS acted unlawfully by relying on raw salvage data to set negative flow thresholds for the Old and Middle

[12] Those Defendant-Intervenors are The Bay Institute; California Trout; Friends of the River; Natural Resources Defense Council; Northern California Council of the Federation of Fly Fishers; San Francisco Baykeeper; Sacramento River Preservation Trust; Winnemem Wintu Tribe; and Pacific Coast Federation of Fishermen's Associations, Inc.

Rivers. Basic scientific principles require the agency to use data scaled to population to determine the impact of exports on fish survival. *Id.* at 827.

- NMFS erred by failing to provide sufficient support for its classification of the winter-run Chinook as "high risk" rather than the less serious classification of "not viable." *Id.* at 864.

- NMFS erred by failing to reconcile the 2009 Salmonid BiOp's jeopardy determination relating to the Southern Resident orca with an apparently contradictory conclusion in a different 2009 BiOp ("2009 Orca BiOp"). *Id.* at 866.

- NMFS failed to adequately explain how continued operation of the Projects will adversely modify the CV steelhead's critical habitat by reducing spawnable area and degrading gravel quality and quantity. *Id.* at 936.

- Although NMFS sufficiently established that delta hydrologic conditions—as altered in part by the Projects—are favorable to invasive species, the BiOp does not support the conclusion that continued CVP/SWP operations promote invasive species, which in turn threaten listed species. *Id.* at 870. Nor does the BiOp sufficiently explain "how the projects influence contaminants or cause food limitations." *Id.*

- NMFS provided no support for its decision to use "maximum steelhead habitat" as a benchmark for evaluating the effect of East Side Division operations on listed species in the Stanislaus River. Because the modeling related to the New Melones Dam flows are

based on the "maximum habitat" benchmark, the New Melones Dam flow limits violate the APA. *Id.* at 938.

- NMFS's modeling assumptions relating to the Stanislaus River are flawed because NMFS set its goal as "doubling" CV steelhead habitat. *Id.* at 950.

- NMFS failed to establish how each RPA Action complies with 50 C.F.R. § 402.02's non-jeopardy factors. Specifically, NMFS did not establish how each RPA Action complies with the many purposes of the CVPIA, *id.* at 918, nor did it consider how each Action is feasible, *id.* at 919. NMFS erred particularly by failing to show how Delta Action IV.4.2 is feasible.

- NMFS erred by failing to explain how certain RPA Actions are "essential" to avoid jeopardy of the listed species or adverse modification of their habitats. *Id.* at 897 & n.26. Those actions are Delta Division RPAs IV.2.1, IV.2.3, and IV.3 and East Side Division RPAs III.1.2, III.1.3, and III.2.2.

Plaintiffs ask us to overturn the following of the district court's holdings that were favorable to the BiOp:

- Reclamation did not violate its obligations under section 7 of the ESA when it accepted the 2009 Salmonid BiOp. *Id.* at 955.

- NMFS did not need to segregate discretionary and non-discretionary agency activities when constituting the environmental baseline. *Id.* at 852.

- NMFS did not err by classifying indirect mortality factors as a direct effect of the continuing Projects. *Id.* at 870–71.

The district court entered its final judgment on December 12, 2011. *See* Final Judgment, ECF No. 655. The parties timely cross-appealed. This court has jurisdiction under 28 U.S.C. § 1291 (2012).

II. STANDARDS OF REVIEW

We review the district court's summary judgment rulings de novo. *McFarland v. Kempthorne*, 545 F.3d 1106, 1110 (9th Cir. 2008) (internal citations omitted). Summary judgment is appropriate when the pleadings and record demonstrate that "there is no genuine dispute as to any material fact and the movant is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(a). This court also reviews de novo the district court's evaluations of an agency's actions. *Sierra Club v. Babbit*, 65 F.3d 1502, 1507 (9th Cir. 1995) ("De novo review of a district court judgment concerning a decision of an administrative agency means we view the case from the same position as the district court."). We evaluate a district court's decision to admit extra-record evidence for abuse of discretion. *Lands Council v. Powell*, 395 F.3d 1019, 1030 n.11 (9th Cir. 2004).

This is a record review case, so we will conduct our own review of the administrative record and, if necessary, "direct that summary judgment be granted to either party . . . ." *Id.* at 1026.

III. THE RECORD ON REVIEW

Before reviewing the merits of the 2009 Salmonid BiOp, we must resolve an initial evidentiary question: Did the district court err in its own record review by supplementing the administrative record with dozens of extra-record declarations? The district court relied on extra-record declarations comprising thousands of pages of scientific opinion, to evaluate and—in some circumstances—call into question the BiOp. *See In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 813 (describing how the parties' cross motions for summary judgment "included . . . thousands of pages of supporting declarations and exhibits"). It did so under our holding in *Lands Council*, 395 F.3d at 1030, which permits district courts to supplement an administrative record in a few limited circumstances. *Id.*; *see* Tr. of Proceeding Mot. to Admit Expert Test. vol. 1, at 12, ECF No. 695 [hereinafter Expert Tr. vol. 1]; *id.* at 14–15 (describing the *Lands Council* exceptions). The question here is whether the district court properly applied *Lands Council*, or whether it went beyond *Lands Council* to improperly question NMFS's scientific determinations. We hold, based in part on our opinion in *Delta Smelt*, 747 F.3d at 602–04, that the district court went beyond the *Lands Council* exceptions when it admitted extra-record declarations and substituted the analysis in those declarations for that provided by NMFS.

In general, a court reviewing agency action under the APA must limit its review to the administrative record. *See Camp v. Pitts*, 411 U.S. 138, 142, 93 S. Ct. 1231, 1244 (1973). We have applied this rule many times, in many different contexts. *See, e.g.*, *Delta Smelt*, 747 F.3d at 602–04 (stating the rule and applying it to strike extra-record declarations admitted by the district court); *Fence Creek*

Cattle Co. v. U.S.F.S., 602 F.3d 1125, 1131 (9th Cir. 2010) ("Generally, judicial review of an agency decision is limited to the administrative record on which the agency based the challenged decision."); *Sw. Ctr. for Biological Diversity v. U.S.F.S.*, 100 F.3d 1443, 1450 (9th Cir. 1996) ("Judicial review of an agency decision typically focuses on the administrative record in existence at the time of the decision and does not encompass any part of the record that is made initially in the reviewing court."); *Asarco, Inc. v. E.P.A.*, 616 F.2d 1153, 1159 (9th Cir. 1980) ("[A]gency action must be examined by scrutinizing the administrative record at the time the agency made its decision.").

This rule ensures that the reviewing court affords sufficient deference to the agency's action. The APA gives an agency substantial discretion "to rely on the reasonable opinions of its own qualified experts even if, as an original matter, a court might find contrary views more persuasive." *Marsh v. Or. Natural Res. Def. Council*, 490 U.S. 360, 378, 109 S. Ct. 1851, 1861 (1989). "When a reviewing court considers evidence that was not before the agency, it inevitably leads the reviewing court to substitute its judgment for that of the agency." *Asarco*, 616 F.2d at 1160. In so imposing its judgment, the reviewing court effectively conducts a de novo review of the agency's action rather than limiting itself to the deferential procedural review that the APA's arbitrary or capricious standard permits. *See River Runners for Wilderness v. Martin*, 593 F.3d 1064, 1070 (9th Cir. 2010) (per curiam).

But we have also recognized several exceptions to this rule. Under *Lands Council*, a reviewing court may consider extra-record evidence where admission of that evidence (1) is necessary to determine "'whether the agency has considered

all relevant factors and has explained its decision,'" (2) is necessary to determine whether "'the agency has relied on documents not in the record,' (3) 'when supplementing the record is necessary to explain technical terms or complex subject matter,' or (4) 'when plaintiffs make a showing of agency bad faith.'" 395 F.3d at 1030 (quoting *Sw. Ctr. for Biological Diversity v. U.S.F.S.*, 100 F.3d at 1450). These exceptions are to be narrowly construed, and the party seeking to admit extra-record evidence initially bears the burden of demonstrating that a relevant exception applies. *See Fence Creek*, 602 F.3d at 1131.

The first *Lands Council* exception—the "relevant factors" exception—is the most difficult to apply, so we pause here to further examine it. Although the relevant factors exception permits a district court to consider extra-record evidence to develop a background against which it can evaluate the integrity of the agency's analysis, the exception does not permit district courts to use extra-record evidence to judge the wisdom of the agency's action. *Asarco*, 616 F.2d at 1160. This distinction is a fine, but important, one. Reviewing courts may admit evidence under this exception only to help the court understand whether the agency complied with the APA's requirement that the agency's decision be neither arbitrary nor capricious. *See id.* at 1159; *see also Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto Ins. Co.*, 463 U.S. 29, 103 S. Ct. 2856 (1983) (further describing the APA's standards). But reviewing courts may not look to this evidence as a basis for questioning the agency's scientific analyses or conclusions. *Asarco*, 616 F.2d at 1160–61.

We most recently considered the scope of the *Lands Council* exceptions in *Delta Smelt*. *See Delta Smelt*, 747 F.3d at 602–04. There, like here, the district court admitted

"multiple declarations from multiple experts" to augment the administrative record. *Id.* at 603. We held that, in doing so, the district court violated the APA for two reasons. First, the court admitted more than forty expert declarations under *Lands Council* in addition to certifying four expert declarations under Federal Rule of Evidence 706. *Id.* at 599 n.13 (citing Fed. R. Evid. 706), 603. We questioned whether the district court needed the extra-record declarations to explain the technical language in the BiOp or provide background material because the Rule 706 court-appointed experts served those purposes. *See id.* at 603. Thus, we were critical of the district court opening the administrative record as a forum for the experts to debate the merits of the BiOp. *Id.* at 603–04.

Second, we held in *Delta Smelt* that the district court erred when it used the extra-record declarations as a basis for judging the wisdom of the agency's scientific analysis. 747 F.3d at 604. Even if a reviewing court properly admits extra-record evidence under *Lands Council*, it may not *use* the admitted extra-record evidence "to determine the correctness or wisdom of the agency's decision." *Asarco*, 616 F.2d at 1160. Such use is never permitted.

Here too, the district court violated *Delta Smelt*'s holding when it used several extra-record declarations to question NMFS's scientific judgments. As in *Delta Smelt*, the district court here "relied . . . on the declarations of the parties' experts-as-advocates as the basis for rejecting the BiOp." 747 F.3d at 604. In this way, the district court overstepped the bounds of *Lands Council* by opening the administrative record as a forum for the experts to debate the merits of the BiOp. The district court employed extra-record declarations at the following points for this impermissible purpose: *In re*

Consolidated Salmonid Cases, 791 F. Supp. 2d at 827, 852 (Deriso Decl., ECF No. 440); *id.* at 829, 832, 834, 841 (Burnham Decl., ECF No. 439); *id.* at 840, 841 (Hilborn Reply Decl., ECF No. 493); *id.* at 863 (Cramer Decl., ECF No. 448); *id.* at 880 (Cummings Decl., ECF No. 445); *id.* at 884, 889–90, 893 (Cavallo Decl., ECF No. 446–1); *id.* at 942–43 (Dotan Decl., ECF No. 442). By admitting these declarations and relying on them to question the wisdom of NMFS's judgments, the district court abused its discretion under *Lands Council*.

IV. THE LEGAL FRAMEWORK

A. The APA

The ESA does not provide its own standard of judicial review, so we evaluate the BiOp under the APA's arbitrary or capricious standard. *See Bennett*, 520 U.S. at 174–77; *Delta Smelt*, 747 F.3d at 601. Section 706(2)(A) of the APA requires a reviewing court to uphold agency action unless it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A). Under this standard, we will "sustain an agency action if the agency has articulated a rational connection between the facts found and the conclusions made." *Pac. Coast Fed'n of Fishermen's Ass'ns v. U.S. Bureau of Reclamation*, 426 F.3d 1082, 1090 (9th Cir. 2005).

The arbitrary or capricious standard is a deferential standard of review under which the agency's action carries a presumption of regularity. *See Citizens to Preserve Overton Park, Inc. v. Volpe*, 401 U.S. 402, 415–16, 91 S. Ct. 814 (1971), *abrogated in part on other grounds as recognized in Califano v. Sanders*, 430 U.S. 99, 97 S. Ct. 980 (1977); *Kern*

Cnty. Farm Bureau v. Allen, 450 F.3d 1072, 1076 (9th Cir. 2006). Although the court's inquiry must be "searching and careful, . . . the ultimate standard of review is a narrow one." *Marsh*, 490 U.S. at 378 (internal citations omitted). Thus, "[e]ven when an agency explains its decision with 'less than ideal clarity,' a reviewing court will not upset the decision on that account 'if the agency's path may be reasonably discerned.'" *Ala. Dep't of Envt'l Conservation v. E.P.A.*, 540 U.S. 461, 497, 124 S. Ct. 983 (2004) (quoting *Bowman Transp. v. Ark.—Best Freight Sys., Inc.*, 419 U.S. 281, 286, 95 S. Ct. 438 (1974)). It is not the reviewing court's task to "make its own judgment about" the appropriate outcome. *River Runners for Wilderness*, 593 F.3d at 1070. "Congress has delegated that responsibility to" the agency. *Id.* "The court's responsibility is narrower: to determine whether the" agency complied with the procedural requirements of the APA. *Id.*

This traditional deference to the agency is at its highest where a court is reviewing an agency action that required a high level of technical expertise. *Marsh*, 490 U.S. at 377; *see also Baltimore Gas & Elec. Co. v. Natural Res. Def. Council, Inc.*, 462 U.S. 87, 103, 103 S. Ct. 2246 (1983) ("When examining this kind of scientific determination . . . a reviewing court must generally be at its most deferential."). As part of this deference, we afford the agency discretion to choose among scientific models; we "reject an agency's choice of a scientific model only when the model bears no rational relationship to the characteristics of the data to which it is applied." *Delta Smelt*, 747 F.3d at 621 (internal citations omitted).

Nevertheless, the deference we owe an agency is not unlimited. We may not automatically defer to an agency's

conclusions, even when those conclusions are scientific. *See Marsh*, 490 U.S. at 378. Rather, our review must be sufficiently probing to ensure that the agency has not

> relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise.

State Farm, 463 U.S. at 43. A different approach "would not simply render judicial review generally meaningless, but would be contrary to the demand that courts ensure that agency decisions are founded on a reasoned evaluation of the relevant factors." *Marsh*, 490 U.S. at 378 (internal citations omitted).

B. The ESA

The ESA requires an agency to use "the best scientific and commercial data available" when formulating a BiOp. 16 U.S.C. § 1536(a)(2); 50 C.F.R. § 402.14(g)(8). An agency's failure to do so violates the APA. *See* 5 U.S.C. § 706(2)(A); *Pac. Coast Fed'n v. Gutierrez*, 606 F. Supp. 2d 1195, 1244 (E.D. Cal. 2008).

The purpose of the best available science standard is to prevent an agency from basing its action on speculation and surmise. *Bennett*, 520 U.S. at 176. Under this standard, an agency must not "'disregard[] available scientific evidence that is in some way better than the evidence [it] relies on.'"

Kern Cnty., 450 F.3d at 1080 (quoting *Sw. Ctr. for Biological Diversity v. Babbitt*, 215 F.3d 58, 60 (D.C. Cir. 2000)). The standard does not, however, require an agency to conduct new tests or make decisions on data that does not yet exist. *See Am. Wildlands v. Kempthorne*, 530 F.3d 991, 998–99 (D.C. Cir. 2008) (holding that an agency's use of available data and test methods was reasonable even though better test methods existed because those test methods had not yet been used on the species in question). Moreover, if the only available data is "'weak,' and thus not dispositive," an agency's reliance on such data "does not render the agency's determination 'arbitrary and capricious.'" *Greenpeace Action v. Franklin*, 14 F.3d 1324, 1336 (9th Cir. 1992) (quoting *Stop H-3 Ass'n v. Dole*, 740 F.2d 1442, 1460 (9th Cir. 1984)). An agency complies with the best available science standard so long as it does not ignore available studies, even if it disagrees with or discredits them. *See Kern Cnty.*, 450 F.3d at 1081 (rejecting Kern's argument that FWS violated the best available science standard when it cited but allegedly misinterpreted three studies).

Finally, what constitutes the best scientific and commercial data available is itself a scientific determination deserving of deference. *Miccosukee Tribe of Indians of Fla. v. United States*, 566 F.3d 1257, 1265 (11th Cir. 2009) (citing *Marsh*, 490 U.S. at 377–78). For that reason "[a] court should be especially wary of overturning such a determination on review." *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 821.

V. THE MERITS OF THE BIOLOGICAL OPINION

With these standards in mind, we evaluate each BiOp component that is challenged on appeal.

Plaintiffs originally challenged dozens of specific components of the 2009 Salmonid BiOp. At summary judgment, the district court upheld as valid many of them, and determined that several others were arbitrary or capricious. *See id.* at 955–59. Defendants appeal each part of the district court opinion in which the court found the BiOp unlawful. Plaintiffs cross-appeal several portions of the opinion in which the district court upheld the BiOp.

We discuss each challenge to the BiOp in turn. First, we address the district court's objections to NMFS's use of raw salvage data. Second, we discuss the challenges to NMFS's jeopardy opinions, including the portion of the BiOp dealing with indirect mortality factors. Third, we review the challenges to NMFS's RPAs, clarifying what the ESA and its implementing regulations require from the agency when it is developing and defining RPAs. We then evaluate the challenged Actions in light of those requirements. Finally, we discuss the three cross-appeal issues.

As our record review will show, the district court—in many instances—did not afford the agency proper deference under the APA. Rather than evaluating the agency's decision-making process and deferring to the agency's scientific conclusions when those conclusions are fairly traceable to the record, the district court engaged in an in-depth substantive review of the science supporting the BiOp and substituted its own opinions, and those of the parties' experts, for the opinions of NMFS. As a result, the district court invalidated much of the BiOp under a quasi de novo review. But the APA does not permit such an in-depth review, particularly where, like here, the conclusions implicate agency expertise. *See Marsh*, 490 U.S. at 375–77.

We correct the district court's errors in our own review; and as a result, we uphold the BiOp in its entirety. After reviewing the record as a whole, we are satisfied that, when developing each component of the BiOp, NMFS relied on the factors that Congress intended it to consider, considered all important aspects of the problem, and offered explanations for its decisions that are in line with the evidence. *See State Farm*, 463 U.S. at 43. We are also satisfied that, in doing so, NMFS used the best scientific data available, even if that science was not always perfect. *Cf. Greenpeace Action*, 14 F.3d at 1336.

A. We Defer To the Agency's Choice To Use Raw Salvage Figures

The Projects pump fresh water out of the Old and Middle Rivers in volumes sufficient to reverse the rivers' traditional flow. *Delta Smelt*, 747 F.3d at 606. Absent pumping, the rivers would flow north into the Delta. Under pumping operations, the rivers flow south to the Jones and Banks pumping plants. Listed species—particularly juveniles—are caught in the negative current and drawn towards the pumping facilities. *See* 2009 Salmonid BiOp at 651. Some of these fish are salvaged at the pumps, meaning they are diverted from the fatal pumping plants to fish salvage facilities and into tanks where they are counted, measured, loaded into trucks, driven north, and dumped back into the Delta.[13] But even if salvaged, fish that are drawn towards the pumps in the Rivers' negative flow have a lower likelihood

[13] *See Fish Facilities Unit Monitoring and Operations Projects*, Cal. Dep't of Wildlife, http://www.dfg.ca.gov/delta/data/salvage/salvageoverview.asp (last visited Oct. 20, 2014, 4:02 p.m.).

of surviving outmigration than their counterpoints that are lucky enough to avoid entrainment.[14]

NMFS concluded in the BiOp that as negative flow of the Old and Middle Rivers increases, fish are more likely to be diverted out of the main Delta and towards the pumping facilities. 2009 Salmonid BiOp at 651. To counter this effect and enhance the likelihood of salmonids successfully exiting the Delta, several of the RPA Actions regulate negative flows and limit exports when fish numbers are high or are likely to be high. NMFS developed these RPA Actions, in part, by considering the raw number of fish salvaged at certain volumes of negative flow. *See id.* at 361–62 (Figs. 65 & 66).

Plaintiffs argue that NMFS violated the ESA by using raw salvage data instead of data scaled to fish population. They assert that the number of fish salvaged every month could be related to the number of fish in the Delta rather than to the volume of negative flows in the Old and Middle Rivers. The district court agreed, concluding that it goes against the grain of traditional science to use raw instead of scaled salvage numbers. *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 827. And because "[t]he agency is required to apply generally recognized and accepted biostatistical principles, which constitute the best available science, in reaching its decisions," NMFS's use of raw salvage data was arbitrary or capricious. *Id.* Defendants appeal that holding here.

[14] A fish is "entrained" when it follows diverted water rather than the natural course of a river, stream, pond, or lake. The danger with entrainment is that fish can become stranded in irrigation canals or killed when they are trapped in pumps.

This issue is almost entirely controlled by our holding in *Delta Smelt*. There, the consulting agency—FWS—also used raw salvage data to set maximum negative flows for the Old and Middle Rivers. *See Delta Smelt*, 747 F.3d at 606–07; 2009 Delta Smelt BiOp at 349–50. We determined that the choice to use raw salvage data was appropriate for three reasons. First, the agency has substantial discretion to choose between available scientific models, provided that it explains its choice. *See Delta Smelt*, 747 F.3d at 610 (citing *Nw. Coal. for Alts. to Pesticides v. E.P.A.*, 544 F.3d 1043, 1050 (9th Cir. 2008)). Second, other studies helped inform the specific flow requirements imposed. Finally, the flow limits "work in tandem with the incidental take statement ("ITS"), which accounts for population-level impacts." *Id.* at 608.

All three factors are present here. First, the agency adequately explained why the loss data, although un-scaled to population, usefully assisted NMFS in identifying whether and how fish loss relates to negative flow velocity. *See* 2009 Salmonid BiOp at 360–62; OCAP BA at 13-43–45.

Second, NMFS—like FWS—did not base its maximum negative flow prescriptions on raw salvage data alone. Rather, it used the same particle tracking models FWS used in the Delta Smelt BiOp to evaluate the effect of heightened exports on naturally buoyant particles. 2009 Salmonid BiOp at 362–63. It also relied on studies, such as a 2008 study by Wim J. Kimmerer, to support its conclusion that there exists a positive relationship between the volume of water exported from project pumping plants and juvenile salmonid entrainment at those plants. *See, e.g.*, *id.* at 361; *Delta Smelt*, 747 F.3d at 612 (describing how FWS used the same study).

Finally, here—like in the Delta Smelt BiOp—the ITS uses population data to scale incidental take, and the RPA uses data generated from incidental take to introduce more restrictive flows in the Old and Middle Rivers. Like the Delta Smelt BiOp, the Salmonid BiOp sets a range of acceptable negative flow in the Old and Middle Rivers and requires the action agency to use population-based data generated from incidental take to scale in more permissive or restrictive flows, with a minimum flow of -5,000 cfs. 2009 Salmonid BiOp at 650.

For these three reasons, the agency acted within its substantial discretion when it used a non-scaled data model to set flows in the Old and Middle Rivers.

B. The Challenged Jeopardy Opinion Components Are Not Arbitrary or Capricious

NMFS determined that the proposed continuing operations of the Projects are likely to jeopardize the viability and essential habitat of the listed species. *Id.* at 575. The district court invalidated several specific components of this provision as arbitrary or capricious. *See In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 955–59. Defendants appeal the district court's holdings, so we review them here.

1. Winter-Run Chinook

According to the district court, NMFS based its finding that ongoing CVP/SWP operations jeopardize winter-run Chinook in part on its determination that winter-run Chinook is at a "high risk" of extinction. *Id.* at 864. The court concluded that NMFS's "high risk" designation was "completely unsupported by the record." *Id.* As a result, the

district court determined that this aspect of the BiOp must be remanded and fixed.

The district court was incorrect in so concluding. NMFS did not characterize winter-run Chinook as being at "high risk of extinction" instead of characterizing the species as being "not viable." *See id.* at 864. Rather, NMFS informed its designation of winter-run Chinook as "not viable" by considering Dr. Lindley's 2007 study, in which he suggests that winter-run Chinook is at a "high risk" of extinction in several categories. *See* 2009 Salmonid BiOp at 85–88. NMFS discussed the limitations of Lindley's categories and explained how it made up for these limitations by relying on other studies. *See id.* (citing McElhany et al. (2000), Liermann and Hilborn (2001), and others). In doing so, NMFS adequately explained how its various descriptions of winter-run Chinook as "high risk" influenced its ultimate jeopardy opinion. Such an explanation is sufficient to satisfy *State Farm*'s requirement that the agency consider all relevant factors and offer an explanation for its conclusion that is grounded in the evidence. *See* 463 U.S. at 43. Thus, this part of the BiOp need not be remanded and fixed.

2. Southern Resident Orca

NMFS concludes in the BiOp that continued CVP/SWP operations are likely to jeopardize the viability of the Southern Resident orca. 2009 Salmonid BiOp at 573–74. The logic supporting this conclusion is relatively simple. The orca population at issue has fewer than ninety members, and so NMFS felt compelled to scrutinize "even small effects on the fitness of individuals that increase the risk of mortality or decrease the chances of successful reproduction." *Id.* at 573. Winter-run and spring-run Chinook are a critical prey base

for the Southern Resident orca. *Id.* According to NMFS, reduction in populations of this prey-base jeopardize the Southern Resident orca because, for example, less food requires whales to spend too much energy foraging and "insufficient prey could cause whales to rely upon their fat stores, which contain high contaminant levels." *Id.* NMFS concluded that continued CVP/SWP operations threaten the viability of winter-run and spring-run Chinook. *Id.* at 574–75. This determination led it to also conclude that these operations jeopardize the Southern Resident orca. *Id.*

The district court reversed and remanded this conclusion. It held that NMFS did not consider all relevant factors of the problem because it failed to discuss a seemingly contrary finding it made, in a BiOp issued on May 5, 2009, that commercial ocean "harvest of salmon would *not* jeopardize the Southern Resident Killer Whales." *See In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 864–65.

The district court's conclusion is incorrect because NMFS did discuss the 2009 Orca BiOp in the Salmonid BiOp, showing that it did not "entirely fail[] to consider" an aspect of the problem. *See State Farm*, 463 U.S. at 43. NMFS discussed the 2009 Orca BiOp as part of its baseline analysis. *See* 2009 Salmonid BiOp at 218–21. NMFS clarified that the 2009 Orca BiOp—unlike the 2009 Salmonid BiOp—does not consider the long-term health of Chinook on the continued viability of the Southern Resident orca, but rather analyzes the year-to-year impact of commercial harvest on the whales' short-term food supply. *Id.* at 218. In this way, NMFS distinguished the two BiOps as dealing with different time frames. NMFS's discussion of how findings in the 2009 Orca BiOp relate to findings in the 2009 Salmonid BiOp, although brief, is sufficient to show that NMFS considered the 2009

Orca BiOp when developing the 2009 Salmonid BiOp. This consideration satisfies NMFS's obligations under *State Farm*. *See* 463 U.S. at 43.

3. Steelhead Critical Habitat

The BiOp makes two relevant conclusions regarding how the proposed action will adversely modify CV steelhead critical habitat in the Stanislaus River. First, NMFS concludes that CV steelhead prefer to spawn when water is flowing at 200 cfs; proposed deviations from that flow could reduce spawnable habitat as much as ninety-five percent in some years. 2009 Salmonid BiOp at 306, 311. Second, NMFS concludes that continued CVP/SWP operations, specifically those that dictate flows from the New Melones and Goodwin Dams, will degrade spawning gravel below the Goodwin Dam, thereby undermining replenishment efforts. *Id.*

The district court found these conclusions to be arbitrary or capricious. Specifically, with regard to spawnable area, the district court found that NMFS used "maximum habitat" as a benchmark for evaluating the Projects' impacts. That benchmark was improper because "maximizing" habitat is not a goal of the ESA. *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 935. The district court also found that no record evidence supported NMFS's conclusion that the CVP/SWP operations cause the recorded gravel loss. *Id.* at 936.

We side with the agency on both issues. First, NMFS did not misapply the ESA by relying on a study that sets a goal of

"maximizing" habitat.[15] The record shows that NMFS looked to Aceituno (1993) and other studies to determine the point at which the Projects' restriction of flows in the Stanislaus River would "appreciabl[y] reduce[]" habitat, *see* 2009 Salmonid BiOp at 42 (citing 50 C.F.R. § 402.02). The record does not show that NMFS abandoned the ESA's prescription to "avoid jeopardy" in favor of Aceiunto's goal of "maximizing habitat," *see id.* (discussing jeopardy requirement). Rather, NMFS explained why Aceiunto's 1993 study provided an adequate baseline for developing minimum and pulse flows in the Stanislaus River.[16] In providing this explanation, NMFS satisfied its obligations under the ESA and *State Farm*. 463 U.S. at 43.

Second, the record provides adequate support (grounded in best available science) for NMFS's conclusion that CVP/SWP operations negatively impact spawning gravel quantity and quality. Before construction of dams, channel forming flows of 8,000 cfs and mobilizing flows of 5,000 to 8,000 cfs created channels—outside of traditional gravel spawning grounds—in which the river deposited fine sediment. 2009 Salmonid BiOp at 308 (citing Mesick (2001);

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[15] It is to be expected that the language of the studies on which an agency relies will not always track the statutory language of the ESA. Not all studies are conducted to serve as a basis for section 7 consultation. Thus, the mere fact that Aceituno's study seeks to "maximize" CV steelhead habitat does not require NMFS to disregard it.

[16] *See* Memorandum from Rhonda Reed, Section 7 Biologist, on The Development of the Reasonable and Prudent Alternatives (RPA) to Avoid Jeopardy to CV Steelhead in the Stanislaus River, Specifically as it Relates to Flow and Temperature 2–9 (May 31, 2009) (NMFS biologist Rhonda Reed describes how NMFS used Aceituno's suggested minimum flows as a starting point but altered those flows based on discussions with agency and stakeholder scientists).

Kondolf *et al.* (2001)). But CVP/SWP operations have all but halted these flows in recent years. *Id.* Thus, fine sediment collects in CV steelhead gravel spawning ground, degrading the quality of spawning areas. *Id.* According to Dr. Kondolf's 2001 study (upon which NMFS bases much of this part of the jeopardy opinion), "poor quality of spawning gravels due to deposition of sand and fine sediment" is one of four primary factors limiting salmon survival in the Stanislaus River.[17] The specific component of the BiOp challenged here essentially adopts this conclusion. *See* 2009 Salmonid BiOp at 308 (citing Kondolf *et al.* (2001)). Although NMFS could have done a better job making the connection between CVP/SWP operations and the quantity of gravel suitable for CV steelhead rearing, that connection is fairly discernable from a review of the "whole record." *See* 5 U.S.C. § 706; *Bowman Transp.*, 419 U.S. at 286. The conclusion is, thus, not arbitrary or capricious.

4. Indirect Mortality Factors

The BiOp evaluates the impact of both direct and indirect mortality factors on listed species. Direct mortality factors, such as entrainment, are those project components that directly harm or kill listed species. *See* 50 C.F.R. § 402.02. Indirect mortality factors are those caused by continued operations that do not directly cause the death of listed species, but lead to it. Those indirect mortality factors include predation, harm inflicted on native species by non-native species, pollution, and food limitations. *See* 2009 Salmonid BiOp at 374. NMFS concludes that CVP/SWP

[17] G.M. Kondolf, et al., *Reconnaissance-Level Assessment of Channel Change and Spawning Habitat on the Stanislaus River Below Goodwin Dam*, Rpt. to the U.S. Fish and Wildlife Service 1 (Mar. 22, 2001).

operations cause indirect mortality for listed species by creating conditions in the Delta that favor non-native species, species that prey on listed Salmonids. CVP/SWP operations also negatively influence the listed species by lengthening the time members remain in the interior delta—where they are exposed to pollution and other indirect mortality factors—before outmigrating to the ocean. *See id.*

Plaintiffs challenged this finding at summary judgment. *See In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 869–71. The district court mostly agreed with them, holding that although NMFS sufficiently established that Delta hydrologic conditions—as altered in part by the Projects—are favorable to invasive species, NMFS failed to articulate the connection among continuing Projects operations, invasive species, and harm to listed species. *See id.* at 870 (posing the following questions: "What effect do these exotics have on the Listed Species? To what extent does the contribution of the Projects to the continued presence of these exotics contribute to the jeopardy finding?"). That failure, according to the district court, rendered the indirect mortality analysis arbitrary and capricious. *Id.* at 870–71.

We disagree. NMFS adequately connected indirect mortality factors to CVP/SWP operations, thus satisfying its obligations under the APA and ESA. NMFS's conclusion that the Projects' operations exacerbate Salmonid indirect mortality proceeds in three steps. First, NMFS explains how, over the past half century, the Projects' operations have worked to degrade the environment in the interior delta, converting a thriving river system into an unnatural inland lake-like habitat ill-suited to many native species. This statement is uncontested. *See id.* at 870 ("Plaintiffs do not directly contest the conclusion that the altered hydrologic

conditions are favorable for invasive species. Nor do Plaintiffs challenge the BiOp's conclusion that CVP and SWP operations contribute to this ecosystem alteration."). Second, NMFS concludes that continued CVP/SWP operations (specifically pumping from the Jones and Banks facilities) cause fish outmigrating through the main channels of the Delta to divert into intersecting channels that split off from the main rivers and lead towards the inner delta. 2009 Salmonid BiOp at 374. The Projects' operations cause this diversion by, among other things, reversing the flows of the Old and Middle Rivers. *Id.* at 651 (citing Vogel (2004) to support the conclusion that "fish chose channels leading south more frequently when exports were elevated, than when exports were lower"). Third, fish that are drawn through intersecting channels and into the inner Delta have a lower survival rate than fish that remain in the main Delta. *Id.* at 375. Not all of these fish are killed in pumping plants; many are eaten by non-native predators, trapped by non-native plants, or fall prey to pollution in the inner Delta. *Id.* at 374–81.

The second step provides the critical causal link between the Projects' operations and indirect mortality factors that the district court found lacking. We find that NMFS cited enough scientific evidence to support its conclusions that high levels of pumping from the Jones and Banks facilities influence fish to swim towards the inner Delta where they fall prey to indirect mortality factors. *See id.* at 651 (citing Vogel (2004), SJRGA (2006), SJRGA (2007), SJRGA (2008)). Although the agency's analysis is not perfect, it may

reasonably be discerned, *see Bowman Transp.*, 419 U.S. at 286, and is thus not arbitrary or capricious.[18]

C. The Challenged RPA Actions Are Not Arbitrary or Capricious

We now consider the RPA Actions invalidated by the district court. Before wading into the specific Actions, we clarify what the ESA and its implementing regulations require from an agency when the agency is developing RPAs as part of a BiOp.

1. The Legal Requirements for an RPA Action

ESA section 7 provides that "[i]f jeopardy or adverse modification is found [during consultation], the Secretary shall suggest those reasonable and prudent alternatives which he believes would not . . . ," 16 U.S.C. § 1536(b)(3)(A),

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[18] Nevertheless, we can see where the district court got derailed into thinking that NMFS blamed continuing CVP/SWP operations for exotics in the Delta. *See In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 870. NMFS essentially makes this statement, without any record support, in its summary of the indirect mortality component of the BiOp. 2009 Salmonid BiOp at 382. The district court properly questioned this conclusion: NMFS did not support the assertion that continuing CVP/SWP operations cause that level of environmental decline. Although NMFS seemed to say as much on page 382 of the BiOp, the crux of its indirect mortality argument is in the pages preceding the summary on page 382. NMFS makes clear that the question is not whether "altered project operations reduce [or exacerbate] the presence of exotics?" but rather "whether altered project operations could keep more fish in the main delta where they are less likely to come into contact with exotic species and die?" As explained, NMFS believes the answer to this question is yes, and it supported its conclusion by relying on the best available science. *See, e.g.*, *id.* at 651.

"jeopardize the continued existence of any endangered [or threatened] species . . ." or result in adverse modification of critical habitat, *id.* § 1536 (a)(2). Reasonable and prudent alternatives are alternative actions identified during formal consultation that (1) "can be implemented in a manner consistent with the intended purpose of the action," (2) "can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction," (3) are "economically and technologically feasible," and (4) "the Director believes would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat." 50 C.F.R. § 402.02. The first three of these factors are the non-jeopardy factors developed by the agency. The final is the jeopardy factor, and it is taken from ESA section 7. *See Delta Smelt*, 747 F.3d at 634.

Under these provisions, the district court reversed and remanded several RPA Actions because the agency did not (1) explain how each RPA Action is "essential to avoid jeopardy," *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 922; *see also id.* at 897 n.26, or (2) explain how each RPA Action complies with § 402.02's three non-jeopardy factors. We recently held in *Delta Smelt* that these are not the correct legal standards under which to evaluate an RPA Action. As we further clarify below, neither section 7 nor § 402.02 require NMFS to explain why each Action is "essential" or to fully elucidate the non-jeopardy factors.

a. The ESA Does Not Require NMFS To Explain How Each RPA Action Is Essential To Avoid Jeopardy

The district court held that § 402.02 requires NMFS to show how each RPA Action is essential to avoid jeopardy.[19] The effect of this holding was to impose an onerous, highly precise standard on NMFS under which the district court invalidated RPA Actions anytime NMFS did not explain why the Action was necessary, over all others, to preserve the species. *See*, *e.g.*, *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 898.

As we explained in *Delta Smelt*, neither the ESA nor its implementing regulations require this level of precision from the agency. The ESA requires only that the agency impose RPAs that are "not likely to jeopardize" the species or its habitat. *See* 16 U.S.C. § 1536(a)(2), (b)(3)(B). The regulations interpret this section as requiring the agency to develop RPAs "that the Director believes" would avoid jeopardy. 50 C.F.R. § 402.02. This moderate and deferential language is a far cry from that which would impose a strictly essential requirement. Rather, this language imposes a "flexible standard for the consulting agency" that does not require the Secretary "to explain why he chose one RPA over another . . . ." *Delta Smelt*, 747 F.3d at 624 (citing *Sw. Ctr. for Biological Diversity v. U.S. Bureau of Reclamation*,

[19] The district court articulated its holding as requiring NMFS to explain how each RPA Action is an "essential component of an overall RPA designed to avoid jeopardy." *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 897 n.26. But in practice, the district court invalidated BiOp provisions when NMFS failed to explain how they were "essential to avoid jeopardy . . . ." *Id.* at 922. That is the holding we review.

143 F.3d 515, 523 (9th Cir. 1998)). Under this deferential standard, the agency need not pick the best RPA or the one most likely to avoid jeopardy. *Id.* Rather, we give the agency flexibility to choose among several appropriate alternatives. We will uphold that choice so long as it is reasonably supported based on a review of the record as a whole. *See Sw. Ctr. for Biological Diversity v. U.S. Bureau of Reclamation*, 143 F.3d at 523.

b. The ESA Does Not Require NMFS To Articulate Compliance with the Non-Jeopardy Factors

The district court also held that Agency regulations require NMFS to describe how each RPA Action meets § 402.02's non-jeopardy factors. *See In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 917. It invalidated several RPA Actions, including Action IV.4.2, for failing to establish compliance with these factors. We hold that the district court erred in interpreting § 402.02.

Again, this issue is largely controlled by *Delta Smelt*. We said in *Delta Smelt* that, "[n]othing in § 402.02 obligates the [consultation agency] . . . to address the non jeopardy factors when it proposes RPAs. Section 402.02 is a definitional section; it is defining what constitutes an RPA, not setting out hoops that the [consultation agency] . . . must jump through." 747 F.3d at 635. Thus, while "a 'thorough' documentation of jeopardy/adverse modification in the BiOp is always required, . . . documentation of the non jeopardy factors is only required when the RPA fails to meet a non jeopardy factor." *Id.* at 635–36. Based on this conclusion, we rejected the district court's finding that the agency acted arbitrarily or capriciously by failing to include "some exposition in the

record of why the agency concluded (if it did so at all) that all four regulatory requirements for a valid RPA were satisfied." *San Luis & Delta-Mendota Water Auth. v. Salazar*, 760 F. Supp. 2d 855, 957 (E.D. Cal. 2010), *aff'd in part rev'd in part by Delta Smelt*, 747 F.3d 581.

This holding applies with equal force here. NMFS is not required to document its compliance with § 402.02's non-jeopardy factors. Rather, it needed only to fairly conclude—based on the record—that the proposed RPAs do not further jeopardize the listed species or adversely affect critical habitats. *See Delta Smelt*, 747 F.3d at 635. We evaluate whether it did so below.

2. Challenged RPA Actions

a. Action IV.2.1

The district court invalidated several RPA Actions related to the San Joaquin Delta. The first, Action IV.2.1, prescribes San Joaquin River inflow to export ratios between April 1 and May 31. 2009 Salmonid BiOp at 641. After a brief adjustment period, Action IV.2.1 requires Reclamation and DWR to implement specific flow to combined export ratios on the San Joaquin River (measured at Vernalis, California). *Id.* at 643. Those ratios are:

San Joaquin Valley Classification	Vernalis flow (cfs): CVP/SWP combined export ratio
Critically dry	1:1
Dry	2:1

Below normal	3:1
Above normal	4:1
Wet	4:1

2009 Salmonid BiOp at 643–44.

The district court invalidated the 4:1 flow-to-export ratio as arbitrary and capricious. Although it concluded that record evidence provided support for some flow-to-export ratio, the district court determined that the agency did not provide sufficient support for the specific 4:1 flow-to-export ratio. *See generally In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 894–98.

We disagree with the district court and hold that the record supports NMFS's decision to impose the 4:1 ratio. NMFS bases its decision to impose a 4:1 flow-to-export ratio primarily on Vernalis Adaptive Management Plan ("VAMP") studies of Chinook salmon smolts. 2009 Salmonid BiOp at 644–45. VAMP has tested Salmonid survival based on a 2:1 ratio, but not a 4:1 ratio. Drawing on VAMP and other data showing a positive correlation between a high-flow-to-low-export ratio and successful salmonid outmigration,[20] NMFS concluded that "flow to export ratios should be at least 2:1 and preferably higher to increase survival and abundance." Stuart 4:1 Memo., *supra*, at 22. NMFS settled on the 4:1

[20] Memorandum from Jeffrey Stuart, NMFS Fisheries Biologist, on The San Joaquin River "4:1 Flow to Export ratio" Reasonable and Prudent Alternative (RPA) for the formal section 7 consultation regarding the Long-Term Operations of the Central Valley Project and State Water Project 20–21 (June 2, 2009) [hereinafter Stuart 4:1 Memo.].

ratio as a high ratio (appropriate in above-normal precipitation years) by studying historic monthly average flows at Vernalis. *Id.* at 16. "This data shows that approximately 6,000 cfs of flow is available at Vernalis in 50 percent of the wet and above normal water years." *Id.* at 17. Being that the minimum export level to maintain health and safety is 1,500 cfs, *id.* at 22, a 4:1 export ratio in wet and above normal years—although maximally protective of fish—is traceable to the record. It is within the agency's discretion to choose a conservative threshold that will afford maximum protection to the species so long as that threshold is fairly supported, which it is. *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 184–85, 98 S. Ct. 2279 (1978).

b. Action IV.2.3 and Action IV.3

Actions IV.2.3 and IV.3 specify river flow management strategies for the Old and Middle Rivers. Although the Old and Middle Rivers typically flow north, CVP and SWP pumping reverses that flow, drawing the water south to the Jones and Banks pumping plants. *See Delta Smelt*, 747 F.3d at 606. According to Particle Tracking Model ("PTM") and fish tagging studies cited by NMFS, listed fish outmigrating through the San Joaquin River are vulnerable to diversion into the channels that lead to the export facilities when pumping is high and the flow of the Old and Middle Rivers is very negative. 2009 Salmonid BiOp at 651. These diverted fish have a lower rate of survival than their counterparts that bypass the inner Delta and migrate directly through the outer Delta to the San Francisco Bay.

Actions IV.2.3 and IV.3 seek to mitigate these effects by imposing negative flow restrictions on the Old and Middle Rivers. Action IV.2.3 requires the Projects to reduce exports

from the Jones and Banks pumping plants between January 1 and June 15 such that the negative flow of the Old and Middle Rivers is limited to -2,500 to -5,000 cfs, depending on the presence of salmonids. *Id.* at 648–52. Action IV.3 requires the Projects to reduce exports between November 1 and December 31 when fish salvage numbers (the numbers of fish caught at the pumps) meet certain triggers. *Id.* at 652–53.

The district court invalidated both Actions. It held, with regard to Action IV.2.3, that the agency did not adequately explain how imposition of the specific flow requirements in the Action are "*essential* to avoid jeopardy." *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 909 (citation omitted). It invalidated Action IV.3 because NMFS based the specific triggers on raw salvage data and "failed to provide any record explanation for why the specific triggers were chosen." *Id.* at 911.

We again reverse the district court and find that the record supports NMFS's decision to impose both Actions. The record fairly supports NMFS's imposition of the particular flow restrictions in Action IV.2.3. PTM modeling cited by NMFS supports the conclusion that risk of fish entrainment at pumping facilities increases substantially between -2,500 and -5,000 cfs. 2009 Salmonid BiOp at 652. That same data shows that the risk of entrainment increases at an even greater rate with flow restrictions more negative than -5,000 cfs. *Id.* Thus, it is reasonable for NMFS to impose the -2,500 to -5,000 cfs range as a minimum negative flow during times when salmonids are likely to pass channel openings. The raw data salvage numbers bolster this conclusion. According to that data, "[l]oss of older juveniles at the CVP and SWP fish collection facilities increases sharply at Old and Middle River flows of approximately -5,000 cfs . . . ." *Id.* at 361. NMFS

explained its rationale for imposing the specific flow restrictions in Action IV.2.3, and supports that rationale with what it has determined is the best available science—PTM studies and raw salvage data.[21] It has, thus, satisfied its procedural and substantive obligations under the APA and ESA.

Action IV.3 is also fairly traceable to the 2009 Salmonid BiOp and accompanying studies. NMFS explains that the triggers imposed by Action IV.3 are developed from previous work done by DWR, Reclamation, NMFS, and FWS.[22] The specific triggers in Action IV.3 (eight fish/thousand acre feet or fifteen fish/thousand acre feet) come from data compiled by NMFS tending to show that when salvage exceeds those levels, there is a pulse of fish in the system. *See* Stuart PTM Memo., *supra*, at 28 (Fig. 15). The agency's decision to set these as particular triggers is based on its own data generated over nine years, data that is well documented in the BiOp and supporting memoranda. *See id.* For that reason, these particular triggers are not arbitrary or capricious.

c. Action IV.4.2

Action IV.4.2 requires DWR to implement specific measures to (1) reduce pre-salvage fish loss and (2) improve

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[21] We have already held, consistent with our opinion in *Delta Smelt*, that NMFS acted within its considerable discretion when it elected to use raw salvage data as a guide for setting certain RPA Actions.

[22] Memorandum from Jeffrey Stuart, NMFS Fisheries Biologist, on Particle Tracking Model results for Old and Middle River flow manipulation (June 3, 2009) [hereinafter Stuart PTM Memo.] (describing how the agencies have used a salmon "decision tree" based on salvage data).

salvage efficiency. 2009 Salmonid BiOp at 655. To reduce pre-salvage loss, the Action requires DWR to "commence studies to develop predator control methods for Clifton Court Forebay," the body of water the fish cross before reaching the Tracy and Skinner Fish Collection Facilities. *Id.* at 656. The Action also sets a specific benchmark for salvage efficiency at the facilities, requiring DWR to "achieve a minimum 75 percent salvage efficiency for CV salmon, steelhead, . . . and green sturgeon" at the Skinner Fish Collection Facility. *Id.* at 655.

Plaintiffs argued that this Action is not technologically or economically feasible and that the agency thus violated § 402.02 by requiring it. The district court agreed. It concluded that NMFS failed to "cite any record evidence indicating that the efficiency improvement, albeit a minor one, is economically or technologically feasible." *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 926.

Delta Smelt made clear that the ESA does not require NMFS to cite record evidence showing that each RPA Action is economically and technologically feasible. *Delta Smelt*, 747 F.3d at 635. Thus, NMFS's failure to cite such evidence here was not arbitrary or capricious.

d. Action III.1.2

The remaining actions challenged by Plaintiffs, invalidated by the district court, and challenged here, relate to CVP/SWP operations on the Stanislaus River, in the east side of the Central Valley.

Action III.1.2 pertains to the temperature of the Stanislaus River. According to NMFS, increased temperature in the

Stanislaus River threatens the critical habitat of the CV steelhead. 2009 Salmonid BiOp at 619–20. To remedy this problem and achieve desired temperatures, Action III.1.2 requires Reclamation to "make cold water releases from New Melones Reservoir to provide suitable temperatures for CV steelhead rearing, spawning, egg incubation smoltification, and adult migration in the Stanislaus River downstream of Goodwin Dam . . . ." *Id.* at 620–21. Action III.1.2 includes an exception to this requirement when the projected temperatures cannot be achieved. *Id.* at 621 (describing the process that Reclamation should use to apply for an exception to the temperature requirements).

The district court remanded this action to the agency after determining that the agency did not sufficiently document "the extent to which this RPA is 'essential' to avoiding jeopardy . . . ." *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 947–49. More specifically, the court determined that because the Action includes an exception with "no limitations" it necessarily does not avoid jeopardy. *Id.* at 947.

The record does not support the district court's conclusion that the "Federal Defendants describe an exception that 'has no limitations.'" *Id.* at 947. NMFS will consider granting an exception to the temperature requirements only when Reclamation demonstrates that "after taking all actions within its authorities, it is unlikely to meet" the temperature requirements. 2009 Salmonid BiOp at 621. If that happens, Reclamation must convene the Stanislaus Operations Group ("SOG")[23] to obtain recommendations on how to proceed.

[23] "Reclamation created a Stanislaus Operations Group (SOG) to provide a forum for real-time operational flexibility and implementation of the alternative actions defined in the RPA." NOAA Fisheries, *Stanislaus*

See id. at 621. If the SOG cannot come to a consensus, NMFS will make recommendations. Reclamation must satisfy several procedural requirements before NMFS will grant an exception under Action III.1.2, leading us to conclude that application of the exception is limited. For this reason, the record supports NMFS's conclusion that imposition of Action III.1.2, notwithstanding its exception, is likely to avoid jeopardy.

e. Action III.1.3

Action III.1.3 also relates to how CVP/SWP operations on the Stanislaus River impact the CV steelhead. CV steelhead adults respond to certain flows in the Stanislaus River as a natural cue for fall migration. Juveniles depend on a particular volume of spring flows to assist them in migrating out of the River to the Delta and eventually to the Pacific Ocean. *Id.* at 625. Pulse flows in the Stanislaus River also benefit CV steelhead habitat by maintaining gravel quality, promoting channel formation, and enhancing access to varied rearing habitats. *Id.* at 624. To better provide these essential cues and to sustain CV steelhead habitat, Action III.1.3 requires Reclamation to "operate releases from the East Side Division reservoir to achieve a minimum flow schedule as prescribed" in the RPA. *Id.* at 623. The minimum flow schedule incorporates short periods of high volume flows in October (fall attraction flows), several times in March and April (outmigration cue flows), and in May (outmigration flows). *Id.*

Operations Group, http://www.westcoast.fisheries.noaa.gov/central_valley/water_operations/sog.html (last visited Oct. 20, 2014, 4:58 p.m.).

The district court invalidated this Action because NMFS failed to explain why the pulse flows would maintain gravel quality in the Stanislaus River. *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 950. It remanded for further explanation on this point, noting that "[p]articularly in light of the potentially high water costs of these pulse flows, the rationale for Action III.1.3 must be lawfully explained and justified on remand." *Id.*

We hold that the district court erred by failing to defer to the Agency's interpretation of a scientific study. NMFS based Action III.1.3's flow numbers on a 2001 study conducted by Dr. Kondolf, et al. In that study, Dr. Kondolf, et al. conclude that "flows around 5,000 to 8,000 cfs are necessary" to mobilize the channel bed material. Kondolf et al., *supra*, at 36. NMFS determined, after weighing the relevant interests, that implementing pulse flows at the low-end of Kondolf's flow range would achieve the appropriate balance between habitat protection and maintaining water reserves in the East Side Division Reservoir. *See* Reed, *supra*, at 7–8. In doing so, NMFS balanced Kondolf's pulse flow suggestions against Reclamation's conclusion that prolonged flows exceeding 1,500 cfs would cause flooding. *See id.* Congress delegated this type of balancing to administrative agencies when it passed the APA and ESA. *See River Runners for Wilderness*, 593 F.3d at 1070. As long as the agency's decision is properly documented, as it is here, we will not overturn it. *See State Farm*, 463 U.S. at 43.[24]

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[24] Nor do we overturn NMFS's choice to use the SJR salmon model to help prescribe pulse flows on the Stanislaus River. Although it is true that the SJR model determines flows needed to double salmon population, NMFS explains why this model was a helpful guide for developing this RPA. Also, NMFS did not rely exclusively on this model to prescribe

f. Action III.2.2

Finally, the district court invalidated RPA Action III.2.2, which relates to floodplain restoration and innundation flows in the Stanislaus River. Prior to the construction of the New Melones Dam in the late 1970s, snow melt from the Sierra Nevada Mountains created pulse flows in the Stanislaus River that formed new and scoured existing channels in the riverbed and surrounding floodplains. 2009 Salmonid BiOp at 627. CV steelhead juveniles used (and continue to use) these channels as a rearing habitat. *Id.* However, the floodplain habitats that were "inundated before operation of the New Melones Dam have become fossilized with fine material and thick riparian vegetation that is never rejuvenated by scouring," *id.*, because pulse flows from New Melones Dam are infrequent. Thus "[f]loodplain juvenile rearing habitat and connectivity will continue to be degraded by New Melones operations, as proposed." *Id.* To remedy this impact, Action III.2.2 requires Reclamation to "seek advice from SOG to develop an operational strategy to achieve floodplain innundation flows that inundate CV steelhead juvenile rearing habitat on a one- to three-year return schedule." *Id.* The district court found this action arbitrary or capricious, holding that because it defines no action *per se*, NMFS did not—and in fact could not—perform a feasibility analysis as required by 50 C.F.R. § 402.02. *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 952.

Stanislaus River flows. *See* Reed, *supra*, at 5–7 (citing, in addition to the SJR salmon model, Aceituno (1993) and Cramer Fish Sciences (2009)). Thus, the record does not support the district court's conclusion that "[n]othing in the record explains why it is appropriate to use a model designed to *double* the existing salmon population to set numeric flow targets to *avoid jeopardy* to the CV steelhead." *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 950.

The district court erred in invaliding this action. We held in *Delta Smelt* that § 402.02 does not require the consultation agency to explain how each Action is feasible. And neither Plaintiffs nor the district court provide any reason why the SOG would recommend an action that Reclamation and DWR could not adopt. *See Sw. Ctr. for Biological Diversity v. U.S. Bureau of Reclamation*, 143 F.3d at 523–24 (noting that feasibility is examined from the perspective of the agency). Thus, this court has no reason to declare that Action III.2.2 violates § 402.02's feasibility factor.

VI. CROSS-APPEAL

Plaintiffs cross-appeal several components of the district court opinion in which the district court upheld the BiOp. We affirm the district court on all three cross-appeal issues.

A. NMFS Need Not Distinguish Discretionary and Non-Discretionary Actions

ESA section 7 provides that, after an agency seeks consultation on a potential project, the agency providing consultation shall write a BiOp "detailing how the agency action affects the species or its critical habitat." 16 U.S.C. § 1536(b)(3)(A). To determine how agency action affects listed species, the consulting agency must analyze the action in relation to the "environmental baseline." 50 C.F.R. § 402.02. "This baseline is intended to form a basic 'snapshot' of the status of the species at a particular moment in time before the action is taken." Liebesman & Petersen, *supra*, at 46.

Plaintiffs argue that NMFS must separate discretionary aspects of the Projects from non-discretionary aspects of the

Projects to define the environmental baseline. The district court disagreed, holding that "[n]othing in the law requires NMFS to segregate discretionary aspects of coordinated Project operations from non-discretionary ones in the manner Export Plaintiffs demand." *In re Consolidated Salmonid Cases*, 791 F. Supp. 2d at 852.

Plaintiffs' discretionary/non-discretionary argument is the same argument that we entertained and rejected in *Delta Smelt*. *See* 747 F.3d at 638–40. We again reject these arguments and affirm the district court on this point.

B. The Biological Opinion's Indirect Mortality Factors Are Direct Effects Under the ESA

For the purposes of ESA section 7 consultation, the "effect" of a proposed action includes both direct and indirect effects. 50 C.F.R. § 402.02. To show that something is an indirect effect of the proposed action, an agency must demonstrate (1) that it is caused by the action, (2) that it is later in time than the action, and (3) that it is reasonably likely to occur. Handbook, *supra*, at 4-27 (citing 50 C.F.R. § 402.02). Whether NMFS needed to make these findings with regard to "indirect mortality factors" identified in the BiOp, *see* 2009 Salmonid BiOp at 374, is a key issue on cross-appeal.

NMFS concludes in the BiOp that CVP/SWP operations subject listed species to indirect mortality factors—such as predation and exposure to toxins—in the inner Delta. *See generally id.* at 374–82. The district court determined that "the indirect mortality findings challenged by Plaintiffs do not constitute 'indirect effects'" within the meaning of 50 C.F.R. § 402.02 because they are "caused by the action

subject to consultation, not by some other action . . . ." *In re Consolidated Salmonid Cases*, 791 F. Supp. 3d at 868 (citing Handbook, *supra*).

We agree with the district court. Indirect effects are typically more attenuated than those described in the 2009 BiOp. *National Wildlife Federation v. Coleman* provides a clear, oft-cited example of an "indirect effect." 529 F.2d 359, 373 (5th Cir. 1976). There, the Fifth Circuit held that the Department of Transportation must consider the residential and commercial development "that can be expected to result from the construction of the highway" as an indirect effect of highway construction. *Id.* NMFS and FWS provide another example of an indirect effect in the consultation handbook. *See* Handbook, *supra*, at 4-29. This example is a little bit closer to home:

> A very complex example of indirect effects arose in determining effects of renewing water services contracts . . . in the San Joaquin Basin . . . . Upon checking with other Federal and State agencies, the FWS determined that the distribution of water for agricultural use on the higher east side of the Valley provided a hydrologic head maintaining the groundwater table on the west side of the Valley at a level making it economical to pump.

Id. As a result, residents could use the pumped water to convert the land to agriculture. But the conversion of the land to agriculture destroyed the habitat of several listed species. *Id.* FWS considered this an indirect effect of renewing the water services contracts. *Id.* These two examples show that

an indirect effect—as envisioned by 50 C.F.R. § 402.02—is one that the action makes possible (or indeed, more probable), but does not directly cause.

The indirect mortality factors described in the BiOp are direct effects. According to NMFS, CVP/SWP operations draw listed fish into the inner Delta by reversing the flows of the Old and Middle Rivers. *See* 2009 Salmonid BiOp at 361–62. NMFS concludes that the interior Delta is a dangerous place for migrating salmonids partially because of Project operations. *See id.* at 374–75, 433. These effects occur concurrently with the Projects; they are not future "indirect" actions "reasonably certain" to occur. *See* 50 C.F.R. § 402.02.

C. Reclamation Is Not Independently Liable Under the ESA

Plaintiffs' argument that Reclamation is independently liable under the ESA is predicated on a finding that the BiOp is legally flawed. *See Pyramid Lake Paiute Tribe of Indians v. U.S. Dep't of the Navy*, 898 F.2d 1410, 1415 (9th Cir. 1990) (compliance with a BiOp satisfies an action agency's procedural obligations under the ESA, but it does not satisfy the agency's substantive obligation to comply with section 7). Because we hold that the BiOp is legally sound, we dismiss Plaintiffs' argument.

VII. CONCLUSIONS

Based on the foregoing, we REVERSE the components of the district court's opinion in which it invalidated the BiOp and AFFIRM the district court with regard to the three issues

on cross-appeal. We REMAND for entry of summary judgment in favor of defendants.

Each party shall bear its own costs.

REVERSED IN PART, AFFIRMED IN PART, AND REMANDED.

GLOSSARY OF TERMS

anadromous fish	fish that ascend rivers from the sea for breeding
APA	Administrative Procedure Act
BA	Biological Assessment
Bay-Delta	San Francisco Bay and Sacramento-San Joaquin Delta
BiOp	2009 Salmonid Biological Opinion
cfs	cubic feet per second
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DWR	California Department of Water Resources
ESA	Environmental Species Act
IFIM	incremental flow instream methodology
ITS	Incidental Take Statement

listed species	(1) the Sacramento River winter-run Chinook salmon ("winter-run Chinook"); (2) the Central Valley spring-run Chinook salmon ("spring-run Chinook"); (3) the Central Valley steelhead ("CV steelhead"); (4) the threatened Southern Distinct Population Segment of North American green sturgeon ("green sturgeon"); and the Southern Resident killer whales ("Southern Resident orcas").
NMFS	National Marine Fisheries Service
the Projects	Central Valley Project and State Water Project
PTM	Particle Tracking Model
RPA	reasonable and prudent alternatives
Reclamation	U.S. Bureau of Reclamation
SOG	Stanislaus Operations Group
SWP	State Water Project
VAMP	Vernalis Adaptive Management Plan