

Case Nos. 18-73014

**IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT**

KELSEY CASCADIA ROSE JULIANA, *et al.*,
Plaintiffs-Appellees,
v.
UNITED STATES OF AMERICA, *et al.*,
Defendants-Appellants.

On Petition For Writ of Mandamus to the United States District Court for the
District of Oregon (No. 6:15-cv-01517-AA)

**EMERGENCY MOTION UNDER CIRCUIT RULE 27-3 TO LIFT STAY IN
CASE NO. 18-73014, OR, ALTERNATIVELY, EXPEDITE REVIEW OF
PETITIONS FOR WRIT OF MANDAMUS (18-73014) AND PERMISSION
FOR INTERLOCUTORY APPEAL (18-80176)**

JULIA A. OLSON
(OSB No. 062230, CSB No. 192642)
Wild Earth Advocates
1216 Lincoln Street
Eugene, OR 97401
Tel: (415) 786-4825

PHILIP L. GREGORY
(CSB No. 95217)
Gregory Law Group
1250 Godetia Drive
Redwood City, CA 94062
Tel: (650) 278-2957

ANDREA K. RODGERS
(OSB No. 041029)
Law Offices of Andrea K. Rodgers
3026 NW Esplanade
Seattle, WA 98117
Tel: (206) 696-2851

*Attorneys for Plaintiffs-Appellees and Real
Parties in Interest*

CIRCUIT RULE 27-3 CERTIFICATE

Pursuant to Circuit Rule 27-3(a), I hereby certify that, to avoid irreparable harm to Plaintiffs-Appellees and Real Parties in Interest Kelsey Cascadia Rose Juliana, et al. (“Plaintiffs”), relief is needed in less than 21 days’ time.

1. Regarding Circuit Rule 27-3(a)(1), counsel for Plaintiffs notified the Clerk of this Court on December 19, 2018 of their intent to file this emergency motion. Plaintiffs also notified counsel for Petitioners-Defendants (“Defendants”) on December 19, 2018.

2. Regarding Circuit Rule 27-3(a)(3)(i), counsel are as follows:

Counsel for Plaintiffs:

Julia A. Olson
(415) 786-4825
juliaaolson@gmail.com
Wild Earth Advocates
1216 Lincoln Street
Eugene, Oregon 97401

Philip L. Gregory
(650) 278-2957
pgregory@gregorylawgroup.com
Gregory Law Group
1250 Godetia Drive
Redwood City, California 94062

Andrea K. Rodgers
(206) 696-2851
andrearodgers42@gmail.com
Law Offices of Andrea K. Rodgers
3026 Esplanade
Seattle, Washington 98117

Counsel for Defendants:

Eric Grant
(202) 514-0943
eric.grant@usdoj.gov

Andrew C. Mergen
(202) 514-2813
andy.mergen@usdoj.gov

Sommer H. Engels
(202) 353-7712
sommer.engels@usdoj.gov

Robert J. Lundman
(202) 514-2946
robert.lundman@usdoj.gov

Environmental and Natural Resources Division
U.S. Department of Justice
Post Office Box 7415
Washington. D.C. 20044

3. Regarding Circuit Rule 27-3(a)(3)(ii), the facts showing the existence and nature of the claimed emergency are set forth in detail below in Section IV (pp. 9-25). In brief, Plaintiffs respectfully request emergency relief because, with every passing day, through Defendants' ongoing systemic actions in creating, perpetuating, and promoting a national fossil fuel energy system, Defendants continue to destabilize the climate system, profoundly endangering Plaintiffs such that, absent preliminary injunctive relief, any time lost in proceeding to trial and implementing a remedy resulting from a continued stay of proceedings constitutes irreparable harm to Plaintiffs. Because Plaintiffs need either to swiftly proceed to

trial to seek a remedy or move for preliminary injunctive relief, they first seek to lift the stay, which is the most efficient course of action to the relief they urgently need.

4. Regarding Circuit Rule 27-3(a)(3)(iii), Defendants' counsel were notified of this emergency motion via email on December 19, 2018 and oppose the motion.

5. Regarding Circuit Rule 27-3(a)(4), Plaintiffs have sought related relief from the district court by motion filed December 5, 2018. That motion, for which Plaintiffs requested expedited consideration and oral argument, is currently pending. On December 17, Defendants filed their response. ECF 449.

s/ Julia A. Olson
Julia A. Olson

*Counsel for Plaintiffs-Appellees and
Real Parties in Interest*

CORPORATE DISCLOSURE STATEMENT

Pursuant to Rule 26.1 of the Federal Rules of Appellate Procedure, Plaintiff Earth Guardians states that it does not have a parent corporation and that no publicly-held companies hold 10% or more of its stock.

TABLE OF CONTENTS

CIRCUIT RULE 27-3 CERTIFICATE	i
CORPORATE DISCLOSURE STATEMENT	iv
TABLE OF CONTENTS	v
TABLE OF AUTHORITIES	vi
I. INTRODUCTION	1
II. STANDARD OF REVIEW	4
III. PROCEDURAL HISTORY	5
IV. ARGUMENT	9
A. The Stay Should Be Lifted Because the Factors Required to Issue a Stay Are Not in Defendants' Favor	9
1. Plaintiffs Are Irreparably Harmed by the Stays	10
2. Defendants Would Not Be Harmed by Proceeding to Trial	21
B. The Most Efficient Means to Move Forward is to Proceed to Trial	24
V. IN THE ALTERNATIVE, PLAINTIFFS REQUEST THAT THIS COURT GRANT EXPEDITED CONSIDERATION OF DEFENDANTS' TWO PENDING PETITIONS	25
VI. CONCLUSION	25
STATEMENT OF RELATED CASES	28
CERTIFICATE OF COMPLIANCE	29

TABLE OF AUTHORITIES

CASES

<i>Alliance for the Wild Rockies v. Salazar</i> , 2011 WL 3794399 (9th Cir. 2011)	25
<i>Bankers Life & Cas. Co. v. Holland</i> , 346 U.S. 379 (1953).....	21
<i>Cachil Dehe Band of Wintun Indians of the Colusa Indian Comm'y v. California</i> , 547 F.3d 962 (9th Cir. 2008).....	2
<i>Canady v. Erbe Elektromedizin GmbH</i> , 271 F.Supp.2d 64 (D.D.C. 2002)	5
<i>CMAX, Inc. v. Hall</i> , 300 F.2d 265 (9th Cir. 1962).....	4, 5, 9
<i>Consumer Cellular, Inc. v. Consumer Affairs.com</i> , 2016 WL 7238919 (D. Or. 2016)	4, 9
<i>Crawford v. Japan Airlines</i> , No. 03-00451 LEKKSC, 2013 WL 2420715 (D. Haw. May 31, 2013)	5
<i>Dependable Highway Express, Inc., v. Navigators Ins. Co.</i> , 498 F.3d 1059 (9th Cir. 2007).....	4
<i>East Bay Sanctuary Covenant v. Trump</i> , ____ F.3d ___, 2018 WL 6428204 (9th Cir. Dec. 7, 2018)	22
<i>Golden Gate Rest. Ass'n v. City of San Francisco</i> , 512 F.3d 1112 (9th Cir. 2008).....	16
<i>Hawai'i v. Trump</i> , 233 F.Supp.3d 850 (D. Haw. 2017).....	5
<i>In re United States</i> , 884 F.3d 830 (9th Cir. 2018).....	23
<i>In re United States</i> , 895 F.3d 1101 (9th Cir. 2018).....	23

<i>Juliana v. United States</i> , No. 18-80176, Dkt. 1-1 (9th Cir. Nov. 30, 2018)	8
<i>Landis v. N. Amer. Co.</i> , 299 U.S. 248 (1936).....	4, 5, 9
<i>Lockyer v. Mirant Corp.</i> , 398 F.3d 1098 (9th Cir. 2005).....	4, 21
<i>Lopez v. Heckler</i> , 713 F.2d 1432 (9th Cir. 1983).....	16, 23
<i>Nken v. Holder</i> , 556 U.S. 418 (2009).....	4, 9
<i>Preminger v. Principi</i> , 422 F.3d 815 (9th Cir. 2005).....	9
<i>Roche v. Evaporated Milk Ass'n</i> , 319 U.S. 21 (1943).....	21
<i>Rodriguez v. Robbins</i> , 715 F.3d 1127 (9th Cir. 2013).....	9
<i>Sampson v. Murray</i> , 415 U.S. 61 (1974).....	21
<i>State of New York, et al., v. United States Department of Commerce, et al.</i> , No. 18-CV-2921, 2018 WL 6060304 (S.D.N.Y. 2018)	23
<i>United States v. Harris</i> , 846 F.2d 50 (9th Cir. 1988).....	25
<i>Valley v. Rapides Par. Sch. Bd.</i> , 118 F.3d 1047 (5th Cir. 1997).....	23
STATUTES	
28 U.S.C. § 1292(b)	6, 8

OTHER AUTHORITIES

- BLM Offers 285 Million Acres for Oil and Gas Lease Sale Within the NPR-A DOI* (Nov. 8, 2018) <https://www.blm.gov/press-release/blm-offers-285-million-acres-oil-and-gas-lease-sale-within-npr> 18
- Brad Plumer and Lisa Friedman, *Trump Team Pushes Fossil Fuels at Climate Talks. Protests Erupt, but Allies Emerge, Too.* (Dec. 10, 2015), https://www.nytimes.com/2018/12/10/climate/katowice-climate-talks-cop24.html?emc=edit_th_181211&nl=todaysheadlines&nlid=567900381211 . 18
- EIA, *November 2018, Monthly Energy Review* (Nov. 2018), <https://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf> 20
- EIA, Short-Term Energy Outlook (Nov. 2018), https://www.eia.gov/outlooks/steo/pdf/steo_full.pdf 20
- Issuance of Presidential Permit to TransCanada for Keystone XL Pipeline*, Dep’t of State (March 24, 2017), <https://www.state.gov/r/pa/prs/ps/2017/03/269074.htm> 18
- Letter from Noel J. Francisco, Solicitor General, U.S. Dep’t of Justice, to Honorable Scott S. Harris, Clerk, Supreme Court of the United States, regarding *Department of Commerce, et al. v. United States District Court for the Southern District of New York, et al.*, No. 18-557 (Nov. 26, 2018), https://www.supremecourt.gov/DocketPDF/18/18-557/73266/20181126163620791_18-557%20Letter.pdf 22
- Merrill, M.D., Sleeter, B.M., Freeman, P.A., Liu, J., Warwick, P.D., and Reed, B.C., 2018, *Federal lands greenhouse gas emissions and sequestration in the United States—Estimates for 2005–14: U.S. Geological Survey Scientific Investigations Report 2018–5131* <https://pubs.er.usgs.gov/publication/sir20185131> 16
- Stockholm Env’t Inst., *Carbon Lock-In from Fossil Fuel Supply Infrastructure* (2015), <https://mediamanager.sei.org/documents/Publications/Climate/SEI-DB-2015-Carbon-lock-in-supply-side.pdf> 19
- The Appellate Lawyer Representatives’ Guide To Practice in the United States Court of Appeals for The Ninth Circuit*, 28 (June 2017 ed.) 21

U.S. Glob. Change Research Program, *Second State of the Carbon Cycle Report: A Sustained Assessment Report* (2018),
https://carbon2018.globalchange.gov/downloads/SOCCR2_2018_FullReport.pdf..... 1, 15

I. INTRODUCTION

Safety, security, and America's promise of liberty for our children are slipping away and will soon be out of reach. According to the world's scientific community, we have only 12 years to transform our nation's energy system away from fossil fuels to avoid irreversible catastrophic harm to these youth Plaintiffs and generations who follow.¹ We do not have 12 years, or even another month, to wait to begin this transition. The work needed to accomplish that energy transition must begin in 2019, first by eliminating coal from our energy system and avoiding unnecessarily locking in more reliance on fossil fuels for energy. The overwhelming evidence shows a delay of even one or two years will lock in impending catastrophes and diminish the possibility of remedying the already present dangers. There is no dispute as to these facts. Defendants' own climate assessments,² published since this Court's November

¹ See IPCC, Global Warming of 1.5°C: Summary for Policymakers 6–7 (2018), https://www.ipcc.ch/site/assets/uploads/sites/2/2018/07/SR15_SPM_High_Res.pdf.

² On November 23, 2018, Defendants released the Fourth National Climate Assessment, a comprehensive report on climate change and its impacts in the United States, endorsed by each of the agency Defendants. USGRCP, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*, U.S. Glob. Change Research Program, available at: <https://www.globalchange.gov/nca4> (hereinafter “NCA4”). The same day, Defendants released the Second State of the Carbon Cycle Report, highlighting major elements of the North American and global carbon cycles and key interactions with climate forcing and feedbacks. U.S. Glob. Change Research Program, *Second State of the Carbon Cycle Report: A Sustained Assessment Report* (2018), https://carbon2018.globalchange.gov/downloads/SOCCR2_2018_FullReport.pdf (hereinafter “SOCCR2”). Plaintiffs request this Court take judicial notice of these publicly available federal reports and the other reports cited herein, which are not

8 Order staying trial, demonstrate that the lives, liberties, and property of American children, including Plaintiffs, are harmed **now** by Defendants' systemic conduct in causing climate change, that the harms are growing increasingly irreversible, and that the timing of implementing substantial greenhouse gas ("GHG") emissions reductions is a critical factor in preventing future harm and averting uncontrollable planetary heating.

In light of these assessments and the lack of any cognizable harm to Defendants in proceeding to trial, Plaintiffs plea with *all possible urgency* that this Court lift the stay imposed by its November 8 Order, Ct. App. IV Doc. 3, and allow this case to proceed to trial and a prompt remedy, should Plaintiffs prevail.³ Plaintiffs also request this Court recommend the district court reconsider its stay of all proceedings imposed by its November 21 Order, ECF 444, because that stay was predicated on this Court's November 8 Order.

With no supporting evidence, Defendants consistently mischaracterize climate change as a slow-moving, long-term, global problem lacking urgency that

already in the district court record. *Cachil Dehe Band of Wintun Indians of the Colusa Indian Comm'y v. California*, 547 F.3d 962, 968 n.4 (9th Cir. 2008); ECF 368.

³ Plaintiffs reference the District Court docket, *Juliana v. United States*, No. 6:15-cv-0157-AA (D. Or.), as "ECF"; the docket for Defendants' Fourth Petition, *In re United States*, No. 18-73014 (9th Cir.), as "Ct. App. IV Doc."; and the docket for Defendants' Fifth Petition, *Juliana v. United States*, 18-80176 (9th Cir.), as "Ct. App. V Doc."

can be addressed, if at all, over time, and that, somehow, it is the fault of these children for waiting so long to sue their government. That narrative runs contrary to the entirety of the record. It is absolutely true that a climate solution will require ongoing efforts through mid-century to transform our energy system, and through the end of the century to continue sequestering excess accumulated carbon. However, that the solution requires sustained effort does not lessen the urgency of the climate emergency *today*, the severe psychological and physical consequences of any further stay of proceedings, or the importance of timely and efficient judicial review.

As the vast majority of trial preparations have been completed, judicial economy is served by lifting the stay, thereby bypassing preliminary injunctive relief, updates to expert reports, and another full round of depositions of experts to reflect new scientific evidence that will indisputably arise during continuation of the stay. Given that Defendants have consistently failed to demonstrate any cognizable harm, and neither the district court, this Court, nor the Supreme Court has found any harm to Defendants in proceeding to trial, the stay should be immediately lifted. If this Court will not lift the stay, Plaintiffs request expedited consideration of Defendants' two currently pending petitions in this Court.

II. STANDARD OF REVIEW

A stay of proceedings is “an exercise of judicial discretion and the propriety of its issue is dependent upon the circumstances of the particular case.” *Nken v. Holder*, 556 U.S. 418, 433 (2009) (quotes, citations omitted). When considering whether to stay proceedings, the Court should consider:

[T]he possible damage which may result from the granting of a stay, the hardship or inequity which a party may suffer in being required to go forward, and the orderly course of justice measured in terms of the simplifying or complicating of issues, proof, and questions of law which could be expected to result from a stay.

Consumer Cellular, Inc. v. ConsumerAffairs.com, 2016 WL 7238919 at *2 (D. Or. 2016) (citing *CMAX, Inc. v. Hall*, 300 F.2d 265, 268 (9th Cir. 1962)). The burden of showing a stay is warranted “lay[s] heavily” on Defendants. *Landis v. N. Amer. Co.*, 299 U.S. 248, 256 (1936). “[T]he suppliant for a stay must make out a clear case of hardship or inequity in being required to go forward, if there is even a fair possibility that the stay for which he prays will work damage to someone else.” *Id.* at 255; *Dependable Highway Express, Inc., v. Navigators Ins. Co.*, 498 F.3d 1059, 1066 (9th Cir. 2007) (same). A stay is particularly inappropriate where the party is seeking injunctive relief against ongoing and future harm, as opposed to damages for past harm. *Lockyer v. Mirant Corp.*, 398 F.3d 1098, 1112 (9th Cir. 2005) (“[B]eing required to defend a suit, without more, does not constitute a ‘clear case of hardship or inequity’ within the meaning of *Landis*.”) A stay should not issue where it would

not “promote economy of time and effort for [the court], for counsel, and for litigants.” *Landis*, 299 U.S. at 254-55. In staying proceedings, neither this Court in its November 8 Order, nor the district court in its November 21 Order, indicated that it performed the requisite analysis.

“When circumstances have changed such that the court’s reasons for imposing [a] stay no longer exist or are inappropriate, the court may lift the stay.” *Hawai‘i v. Trump*, 233 F.Supp.3d 850, 854 (D. Haw. 2017) (quoting *Crawford v. Japan Airlines*, No. 03-00451 LEKKSC, 2013 WL 2420715, at *6 (D. Haw. May 31, 2013)); accord *CMAX, Inc.*, 300 F.2d at 270. “Logically, the same court that imposes a stay of litigation has the inherent power and discretion to lift the stay.” *Canady v. Erbe Elektromedizin GmbH*, 271 F.Supp.2d 64, 74 (D.D.C. 2002).

III. PROCEDURAL HISTORY

The background of this case is comprehensively set forth in Plaintiffs’ opposition to Defendants’ Fourth and Fifth Petitions pending in this Court. *See Ct. App. IV Doc. 5* at 1-14; *Ct. App. V Doc. 2* at 3-11. To reiterate the continuing injustice and harm to Plaintiffs that will result should the stays remain in place, necessitating a motion for injunctive relief, Plaintiffs highlight Defendants’ repeated efforts to delay trial.

Over three years have passed since the Complaint was filed. Plaintiffs initially informed the district court that any delay in getting to trial would necessitate a

motion for preliminary injunction in light of the ongoing, irreparable harms being suffered by Plaintiffs. *See Declaration of Julia A. Olson in Support of Emergency Motion (“Olson Decl.”), ¶ 8.* In response, the district court urged Plaintiffs to wait for an early trial. *Id.* Instead of a prompt hearing on appropriate equitable relief, Defendants have continued their ongoing unconstitutional conduct in causing climate change and obstructed the path to justice in this case. *Id.* ¶¶ 16, 17, Exhs. 5, 6. This miscarriage of justice continues despite Plaintiffs prevailing on each of Defendants’ motions and petitions for dismissal, judgment, and mandamus at all three levels of the federal judiciary, and in spite of the fact that the parties are ready to commence trial. *Id.* ¶ 9.

On November 5, Defendants filed their fourth Petition in this Court, requesting a stay of proceedings and again claiming non-specific and unsupported separation of powers harms from general participation in litigation. Ct. App. IV Doc. 1-2. On the same day, Defendants moved the district court to reconsider its denials of previous requests to certify prior orders for interlocutory appeal under 28 U.S.C. § 1292(b) and to stay litigation. ECF 418, 419. *In requesting the stays, Defendants put forth no cognizable evidence they will suffer damage in proceeding to trial.*

On November 8, this Court issued a partial temporary stay, preventing the setting of a new trial date. Ct. App. IV Doc. 3. The November 8 Order allowed both discovery and pre-trial matters to proceed “pending this court’s consideration of

th[e] petition for writ of mandamus.” *Id.* In granting the partial temporary stay, this Court did not perform any analysis as to the harms Defendants would suffer absent a stay and granted the stay before Plaintiffs had an opportunity to oppose the stay.⁴

On November 21, in response to this Court’s November 8 Order, the district court *sua sponte* certified four prior orders for interlocutory appeal and stayed the entire case pending a decision by this Court. ECF 444 at 6. In its November 21 Order, the district court indicated it “stands by its prior rulings on jurisdictional and merits issues, as well as its belief that this case would be better served by further factual development at trial.” *Id.* at 5. Neither this Court’s nor the district court’s stay Order identified *any* harm Defendants would suffer in proceeding to trial, nor did either stay Order evaluate the harm Plaintiffs would suffer with further delay or the inefficiencies such delay would cause.

As more fully set forth in the parties’ Joint Report on the Status of Discovery, Ct. App. IV. Doc. 12, Defendants will suffer no cognizable hardship in finalizing the remaining discovery, which does not require disclosure of any confidential or privileged information nor require Defendants to take any policy positions. Olson Decl., ¶¶ 2-4, 6, Exh. 1. There remain only: (a) depositions of two rebuttal and one

⁴ Pursuant to Rule 27(a)(3)(A), Plaintiffs had until November 15 to oppose Defendants’ motion for stay filed on November 5, Ct. App. IV Doc. 1-2. This Court ruled on November 8 before Plaintiffs had an opportunity to file their opposition brief.

sur-rebuttal experts and five Plaintiffs; and (b) completion of briefing and hearing on the pending pretrial motions.⁵ *Id.*; see Ct. App. IV. Doc. 12. No high-level officials of the federal government will be witnesses at trial. Olson Decl. ¶ 4, Exh. 2.

On November 30, Defendants petitioned for permission to appeal pursuant to 28 U.S.C. § 1292(b). Ct. App. V. Doc. 1-1. Plaintiffs filed their opposition on December 10. Ct. App. IV. Doc. 2-1. On December 5, Plaintiffs moved for reconsideration of the district court's November 21 Order, seeking expedited consideration and permission to complete discovery and pretrial proceedings. ECF 446. On December 17, Defendants filed their opposition, arguing the stay "maintains the status quo while the Ninth Circuit considers Defendants' § 1292(b) Petition." ECF 449 at 8. The "status quo" in Defendants' view is "the status of discovery," rather than Plaintiffs' security and the state of the climate system. *Id.* The district court has not ruled on the motion or the request for expedited consideration.

Defendants' Petitions for Writ of Mandamus, Case No. 18-73014, and Permission to Appeal, Case No. 18-80176, are fully briefed and await decision by

⁵ Defendants may claim there are seven possible additional depositions, but never propounded any discovery regarding Plaintiffs' fact witnesses (apart from the youth Plaintiffs themselves) and served no deposition notices for those fact witnesses. Olson Decl. ¶ 5.

this Court. While this Court issued its stay in response to the Petition for Writ of Mandamus, both Petitions are implicated in this Motion.

IV. ARGUMENT

A. The Stay Should Be Lifted Because the Factors Required to Issue a Stay Are Not in Defendants' Favor

Given the damage to Plaintiffs resulting from the stay and the absence of any harm to Defendants, the stay should be immediately lifted. Defendants have offered no evidence of cognizable harm justifying a stay, and neither this Court nor the district court made any findings that Defendants established *any* of the factors necessary for a stay, including:

[T]he possible damage which may result from the granting of a stay, the hardship or inequity which a party may suffer in being required to go forward, and the orderly course of justice measured in terms of the simplifying or complicating of issues, proof, and questions of law which could be expected to result from a stay.

ConsumerAffairs.com, 2016 WL 7238919 at *4 (citing *CMAX, Inc.*, 300 F.2d at 268);⁶ *Landis*, 299 U.S. at 254–55.

⁶ As explained in *ConsumerAffairs.com*, the four-part *Nken* test for stays of enforcement of judgments pending appeal does not apply to stays pending an interlocutory appeal lacking the potential to resolve all claims in an action. 2016 WL 7238919 at *4. As Plaintiffs explained, neither the Fourth Petition nor the Fifth Petition could resolve all claims in this case. See Ct. App IV Doc. 5 at 24; Ct. App. V Doc. 2-1 at 17, 19. Even if the *Nken* factors did apply, Plaintiffs' filings establish that Defendants are not likely to succeed on the merits of their pending Petitions. Further, the public interest is served by allowing Plaintiffs to vindicate constitutional violations. *Rodriguez v. Robbins*, 715 F.3d 1127, 1146 (9th Cir. 2013) (quoting *Preminger v. Principi*, 422 F.3d 815, 826 (9th Cir. 2005)).

1. Plaintiffs Are Irreparably Harmed by the Stays

The overwhelming evidence shows that Plaintiffs are and will continue to suffer substantial harm from *any* further delay in resolving their claims. Dr. Hansen, a renowned former long-time NASA climatologist, opines: “further delay in the commencement of rigorous, systemic, comprehensive, and sustained action to phase out CO₂ emissions and draw down atmospheric CO₂ risks imminent catastrophe—a conclusion shared by most climate scientists.” ECF 274-1 at 3. Defendants have proffered ***zero evidence*** to contest Plaintiffs’ evidence of the damage they are suffering from this delay and the dire urgency of their claims. Atmospheric CO₂ concentrations are already well into the danger zone and Defendants’ unlawful conduct enhances that danger every day. *See, e.g.*, ECF 262-1, 274-1, 275-1 (expert declarations of Drs. James Hansen, Harold Wanless, and Eric Rignot). There is no evidence to the contrary in the record. None.

Defendants’ NCA4 and SOCCR2, each released fifteen days after this Court’s stay, unmistakably affirm that the “substantial damages” Plaintiffs are already suffering will continue to worsen if trial does not commence immediately and a remedy is not implemented promptly, because the magnitude of Plaintiffs’ harm is correlated to the amount of GHG emissions released into the atmosphere:

Earth’s climate is now changing faster than at any point in the history of modern civilization Climate-related risks will continue to grow without additional action. ***Decisions made today*** determine risk

exposure for current and future generations and will either broaden or limit options to reduce the negative consequences of climate change.

NCA4, *Chapter 1: Overview*, 34 (emphasis added). Other NCA4 findings highlight the harms Plaintiffs are suffering and the urgent need for Defendants to reduce GHG emissions:

- “The scale of risks [defined as ***threats to life, health and safety***, the environment, economic well-being, and other things of value] that can be avoided through mitigation actions [defined as reducing GHG emissions and removing them from the atmosphere] ***is influenced by the magnitude of emissions reductions [and] the timing of those reductions . . .***” *Id.* at Ch. 29, 1348.
- “Research supports that ***early and substantial mitigation offers a greater chance of avoiding increasingly adverse impacts.***” *Id.* (emphases added).
- “[D]elayed and potentially much steeper emissions reductions jeopardize achieving any long-term goal . . . [with] the potential for abrupt consequences.” *Id.* at Ch. 29, 1351.
- “Evidence exists that ***early mitigation can reduce climate impacts in the nearer term . . . and, in the longer term, prevent critical thresholds from being crossed.***” *Id.* (emphases added).
- Climatic changes “are affecting the health and well-being of the American people, ***causing injuries, illnesses, and death.***” *Id.* at Ch. 14, 541.

In the NCA4, Defendants acknowledge that climate change is already causing the types of injuries that Diné Plaintiff Jaime B. is experiencing on the Navajo Reservation. *Id.* at Ch. 15 (*Tribes and Indigenous Peoples*); ECF 282 (Declaration of Jaime B.).

- “***Observed*** and projected ***changes*** of increased wildfire, diminished snowpack, pervasive drought, flooding, ocean acidification, and sea level rise threaten the viability of Indigenous peoples’ traditional subsistence and commercial activities that include agriculture,

hunting and gathering, fisheries, forestry, energy, recreation, and tourism enterprises.” NCA4 at Ch. 15, 574 (emphases added).

Specific to Jaime’s personal security and ability to protect her family’s culture and autonomy, Defendants admit:

- “In the Southwest, the loss of stability and certainty in natural systems may affect physical, mental, and spiritual health of Indigenous peoples with close ties to the land. For example, extended drought raises concerns about maintaining Navajo Nation water-based ceremonies essential for spiritual health, livelihoods, cultural values, and overall well-being.” *Id.* at Ch. 25, 1132.
- “Climate impacts to lands, waters, foods, and other plant and animal species threaten cultural heritage sites and practices that sustain intra- and intergenerational relationships built on sharing traditional knowledges, food, and ceremonial or cultural objects. This weakens place-based cultural identities, may worsen historical trauma still experienced by many Indigenous people in the United States, and adversely affects mental health and Indigenous values-based understandings of health.” *Id.* at Ch. 15, 574.
- “Indigenous agriculture is already being adversely affected by changing patterns of flooding, drought, dust storms, and rising temperatures.” *Id.* at Ch. 15, 579.
- Climate change is altering relationships “central to Indigenous physical, mental, and spiritual health This alteration in relationships occurs when individuals, families, and communities (within and between generations) are less able or not able to share traditional knowledges about the natural environment [], food, and ceremonial or cultural objects, among other things, because the knowledge is no longer accurate or traditional foodstuffs and species are less available due to climate change. For many Indigenous peoples, the act of sharing is fundamental to these intra- and intergenerational relationships, sustains cultural practices and shared identity, and underpins subsistence practices.” *Id.* at Ch. 15, 582.

These impacts are the very impacts that Jaime B. is *already* experiencing. ECF 282 at ¶¶ 4, 12-15 (Jaime B. had to move from her traditional home on the Reservation

because of extended drought, harming her significantly, and her ability to participate in sacred Navajo ceremonies was adversely impacted due to drought and scarcity of once plentiful medicinal plants, causing her to lose her dignity and way of life.).

For Plaintiffs Alex, Isaac, Tia, and Nathan, who have asthma, their physical health and safety are damaged by climate change-induced wildfires and ongoing GHG pollution that affects local air quality.

- “Climatic changes, including warmer springs, longer summer dry seasons, and drier soils and vegetation, have already lengthened the wildfire season and increased the frequency of large wildfires. . . . resulting in adverse impacts to human health.” NCA4 at Ch. 13, 514.
- “Wildfire smoke can worsen air quality locally, with substantial public health impacts in regions with large populations near heavily forested areas. Exposure to wildfire smoke increases the incidence of respiratory illnesses, including asthma, chronic obstructive pulmonary disease, bronchitis, and pneumonia.” *Id.* at Ch. 13, 519.
- “[M]itigating GHG emissions can lower emissions of particulate matter (PM), ozone and PM precursors, and other hazardous pollutants, reducing the risks to human health from air pollution.” *Id.* at Ch. 13, 514.
- “[C]hildren . . . are especially susceptible to ozone and PM-related effects.” *Id.* at Ch. 13, 517.
- “Short- and long-term exposure to these pollutants results in adverse respiratory and cardiovascular effects, including premature deaths, hospital and emergency room visits, **aggravated asthma**, and shortness of breath.” *Id.* (emphasis added).

Defendants’ NCA4 warns that children and youth, like Plaintiffs, “will likely experience cumulative physical and mental health effects of climate change over their lifetimes,” and that these climate stressors can have life-long consequences. *Id.* at Ch. 24, 1050. “Evidence shows that exposure to both pollution and trauma in life

is detrimental to near-term health, and an increasing body of evidence suggests that early-childhood health status influences health and socioeconomic status later in life.” *Id.* Plaintiff Aji has been harmed by the mental health effects of climate change and Defendants’ conduct in causing it, which have contributed to depression, insomnia, panic, and persistent stress. *See Declaration of Aji P. in Support of Emergency Motion (“Aji Decl.”).* The ongoing stays of this case exacerbate the emotional harm Aji experiences which is akin to being in a pressure cooker where every hour of the day matters; his government exacerbates his harm with more promotion of fossil fuels, while his judiciary stays his case without reasoning why the government’s harm in proceeding to trial is worse than his own harm, both in not having his case tried and in failing to provide opportunities for early and substantial mitigation of emissions thereby avoiding increasingly adverse impacts. *Id.* ¶¶ 4-13.

Defendants’ NCA4 confirms the August 2016 floods that damaged Plaintiff Jayden’s health and home were climate-induced, will become more frequent, and will continue to pose imminent threats to her physical and mental health. NCA4 at Ch. 3 (*Water*), Ch. 14 (*Human Health*), Ch. 19 (*Southeast*). Defendants’ NCA4 evidences the urgent need for near-term steep emissions reductions to prevent the worsening and locking in of many of Plaintiffs’ particularized individual injuries. It makes abundantly clear that *any delay* in Defendants reducing emissions makes a

remedy less likely. Defendants have not and cannot dispute this evidence emanating from the agencies themselves.

Defendants' SOCCR2 also demonstrates the emergency facing Plaintiffs, presenting key findings regarding increasingly rapid changes in the carbon cycle, which are converting carbon sinks into carbon sources, further exacerbating the harm:

- “The carbon cycle is changing at a much faster pace than observed at any time in geological history. . . .” SOCCR2 at 27.
- “Arctic surface air temperatures are rising about 2.5 times faster than the global average. This increase can destabilize permafrost soils . . . which exist throughout the Arctic and store almost twice the amount of carbon currently contained in the atmosphere. Warming temperatures can release this stored carbon into the atmosphere.” *Id.* at 2-3.⁷
- “[A] range of research suggests the carbon uptake capacity of [land and ocean ecosystems] may decline in the future, with some reservoirs switching from a net sink to a net source of carbon to the atmosphere.” SOCCR2 at 28.
- Ocean acidification is a “major concern” and the amount of CO₂ absorbed by the oceans has been increasing steadily, creating a significant stressor for marine ecosystems. *Id.* at 670–74.

These threats are mounting every day. Plaintiff Aji’s emotional pressure cooker is a reflection of the tangible one. Undisputed science shows the damage from emissions

⁷ In December, NOAA released the 2018 Arctic Report Card, confirming the urgent threat of harm. NOAA, Arctic Report Card: Update for 2018, <https://arctic.noaa.gov/Report-Card/Report-Card-2018/ArtMID/7878/ArticleID/772/Executive-Summary>. Judicial notice is requested.

tomorrow, next month, and next year cannot be undone for hundreds of years. As such, the status quo of mounting U.S. GHG emissions is harming Plaintiffs now.

As this Court held, when “the physical and emotional suffering shown by plaintiffs in the record before us is far more compelling than the possibility of some administrative inconvenience or monetary loss to the government,” a stay that prevents a meaningful remedy should not issue. *Lopez v. Heckler*, 713 F.2d 1432, 1437 (9th Cir. 1983) (denying stay of preliminary injunction where government would suffer financial harm and inconvenience, but plaintiff class would suffer emotional and potentially physical harm, and retroactive relief would not later undo the harm). “Faced with such a conflict between financial concerns and preventable human suffering, we have little difficulty concluding that the balance of hardships tips decidedly in plaintiffs’ favor.” *Id.*; see *Golden Gate Rest. Ass’n v. City of San Francisco*, 512 F.3d 1112, 1126 (9th Cir. 2008).

Finally, a November 2018 U.S. Geological Survey (“USGS”) report confirms the substantial greenhouse gas emissions associated with the extraction and use of fossil fuels from Federal lands, for which Defendants are responsible.⁸ The USGS Report estimates that emissions from fossil fuels produced on Federal lands alone

⁸ Merrill, M.D., Sleeter, B.M., Freeman, P.A., Liu, J., Warwick, P.D., and Reed, B.C., 2018, *Federal lands greenhouse gas emissions and sequestration in the United States—Estimates for 2005–14: U.S. Geological Survey Scientific Investigations Report 2018–5131*, 31, <https://pubs.er.usgs.gov/publication/sir20185131> (“USGS Report”). Judicial notice is requested.

represent, on average, 23.7% of national emissions for carbon dioxide (“CO₂”) over the 10 years studied,⁹ and coal extracted from Federal lands accounts for over 40% of coal emissions.¹⁰ Nationwide emissions from fossil fuels produced on Federal lands in 2014 were 1,279.0 million metric tons of carbon dioxide equivalent (MMT CO₂ Eq.) for CO₂.¹¹ Fossil fuels extraction on Federal lands is only one component of Defendants’ unconstitutional fossil fuel energy system, which touches in some consequential way every ton of CO₂ emitted from our Nation’s territory. ECF 384 at 24-35 (Pre-Trial Memorandum describing Defendants’ control over the fossil fuel energy system).

Notwithstanding Defendants’ acknowledgement in these reports of the substantial role and dangers of fossil fuels and the urgent need for GHG emission reductions to avoid locking in irreversible harms, Defendants have doubled-down in their unconstitutional systemic conduct, continuing their exacerbation of the climate crisis and making the “status quo” harmful to Plaintiffs. As Defendants recently stated: “The United States has an abundance of natural resources and is not going to keep them in the ground.”¹² Moreover, since November 2016, when Plaintiffs first

⁹ *Id.* at 6.

¹⁰ ECF 98 at ¶ 166 (Defendants’ Answer admitting 40% of coal produced in the United States comes from Federal lands).

¹¹ USGS Report at 6.

¹² Brad Plumer and Lisa Friedman, *Trump Team Pushes Fossil Fuels at Climate Talks. Protests Erupt, but Allies Emerge, Too.* (Dec. 10, 2015), <https://www.nytimes.com/2018/12/10/climate/katowice-climate-talks->

informed the district court of the need for preliminary injunctive relief or an immediate trial date, ECF 100, Defendants have:

- Offered 78 million acres offshore Texas, Louisiana, Mississippi, Alabama, and Florida for oil and gas exploration and development (ECF 341-135);
- Offered 2.85 million acres of land for oil and gas lease sale within the National Petroleum Reserve in Alaska;¹³
- Removed National Monument status from federal lands to allow oil and gas extraction (ECF 381-17);
- Leased 56 million tons of coal for extraction from land in Utah (ECF 341-110);
- Issued a Presidential Permit for Keystone XL Pipeline authorizing TransCanada to construct, operate, and maintain pipeline facilities for the importation of crude oil;¹⁴
- Expedited approval and construction of the Dakota Access Pipeline (ECF 341-116);
- Proposed grid pricing rules that encourage coal-fired electricity generation (ECF 381-361);
- Ended the moratorium on coal leasing on federal land (ECF 341-48);
- Withdrawn the Clean Power Plan and replaced it with the Affordable Clean Energy Rule, which Defendants admit will result in higher CO₂ emissions and longer-term reliance on coal (ECF 381-315);
- Rolled back emission standards for passenger cars and light trucks, which Defendants admit will increase fossil fuel consumption (ECF 341-390);

cop24.html?emc=edit_th_181211&nl=todaysheadlines&nlid=567900381211.
Judicial notice is requested.

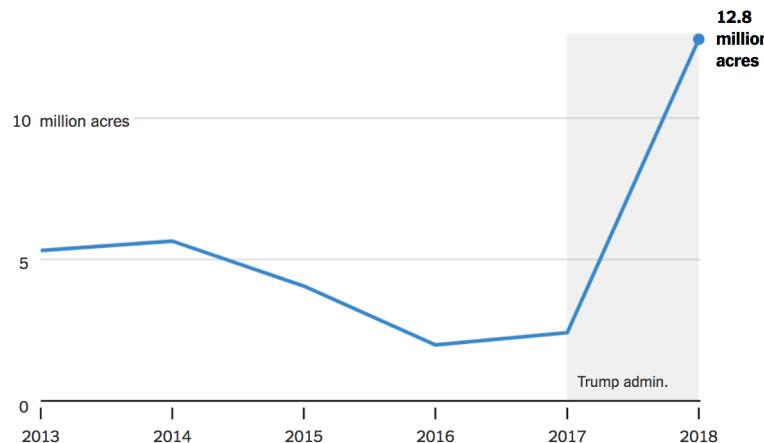
¹³ *BLM Offers 2.85 Million Acres for Oil and Gas Lease Sale Within the NPR-A*, DOI (Nov. 8, 2018) <https://www.blm.gov/press-release/blm-offers-285-million-acres-oil-and-gas-lease-sale-within-npr>. Judicial notice is requested.

¹⁴ *Issuance of Presidential Permit to TransCanada for Keystone XL Pipeline*, Dep't of State (March 24, 2017), <https://www.state.gov/r/pa/prs/ps/2017/03/269074.htm>. Judicial notice is requested.

- Rescinded regulations intended to reduce methane leaks from oil and gas operations (ECF 341-95); and
- Systematically expressed support for and promoted the fossil fuel industry (ECF 299-163, 341-6, 341-108).

Federal Land For Sale

The amount of federal land offered at oil and gas lease sales has greatly increased under the Trump administration.



By The New York Times | Source: Bureau of Land Management

15

These are long-lasting investments by Defendants in fossil fuel-based infrastructure, modes of transit, and energy supply that “lock-in” the use of fossil fuels, making it harder to transition to carbon-free energy sources and thus harder to redress Plaintiffs’ injuries.¹⁶ By pursuing high-carbon energy sources through 2020, the cost to reduce CO₂ emissions after 2020 will increase fourfold.¹⁷ A report recently issued

¹⁵ <https://www.nytimes.com/2018/10/27/climate/trump-fracking-drilling-oil-gas.html>

¹⁶ See Stockholm Env’t Inst., *Carbon Lock-In from Fossil Fuel Supply Infrastructure* (2015), <https://mediamanager.sei.org/documents/Publications/Climate/SEI-DB-2015-Carbon-lock-in-supply-side.pdf>.

¹⁷ *Id.*

by the EPA confirms that unabated GHG emissions will result in profound economic losses to the U.S. economy, costing trillions of dollars.¹⁸

Defendants claim the stays are necessary to “maintain[] the status quo” of *discovery* in this case, while Defendants proceed to destroy Plaintiffs’ lives and liberties with their dangerous energy system, which is further destabilizing the status quo of an *already destabilized climate system*. ECF 449 at 8. Defendants’ concerted efforts to double-down on fossil fuel extraction, transportation, and combustion, have increased U.S. CO₂ emissions in 2018. In the decade preceding 2016 (from 2007 to 2016), U.S. energy-related CO₂ emissions were decreasing by about 1.5% annually,¹⁹ but still at dangerous levels and the second highest in the world. In 2017, U.S. energy-related CO₂ emissions declined again.²⁰ However for 2018, the Energy Information Administration (“EIA”) expects U.S. CO₂ emissions will *increase by 2.5%*.²¹

¹⁸ EPA. 2017. Multi-Model Framework for Quantitative Sectoral Impacts Analysis: A Technical Report for the Fourth National Climate Assessment. U.S. Environmental Protection Agency. EPA 430-R-17-001, https://cfpub.epa.gov/si/si_public_record_Report.cfm?Lab=OAP&dirEntryId=335095. Judicial notice is requested.

¹⁹ EIA, November 2018, *Monthly Energy Review* 201 (Nov. 20, 2018), <https://www.eia.gov/totalenergy/data/monthly/pdf/mer.pdf>. Judicial notice is requested.

²⁰ EIA, Short-Term Energy Outlook 2 (Nov. 6, 2018), https://www.eia.gov/outlooks/steo/pdf/steo_full.pdf. Judicial notice is requested.

²¹ *Id.*

It could not be clearer that absent timely trial on Plaintiffs' claims and implementation of a remedy now – *not after a more than two-year delay for interlocutory appeal* – Defendants will continue to engage in their unconstitutional systemic acts, locking in more accumulated CO₂ and making Plaintiffs' injuries potentially irreversible. *See Olson Decl.* ¶ 18, 19, Exh. 8 (depicting projected timeline to trial and appellate review if the stay is lifted (Path A) and if the stay is not lifted and the case is reviewed on interlocutory appeal (Path B)).

2. Defendants Would Not Be Harmed by Proceeding to Trial

The harm Defendants assert absent a stay—participating in limited pretrial proceedings and trial—does not constitute inequity or undue hardship. *Sampson v. Murray*, 415 U.S. 61, 90 (1974) (“Mere injuries, however substantial, in terms of money, time and energy necessarily expended in the absence of a stay, are not enough.”); *Lockyer*, 398 F.3d at 1112 (defending a suit “does not constitute a ‘clear case of hardship or inequity’”).²² As set forth in the parties’ Joint Status Conference Statement, there remain only: (a) the depositions of three rebuttal and sur-rebuttal experts (all in California) and five plaintiffs (to be deposed in Eugene, OR); and (b) completion of the briefing on five pending motions. *Olson Decl.* ¶ 2, Exh. 1 at 3, 6-

²² See also *Bankers Life & Cas. Co. v. Holland*, 346 U.S. 379, 383 (1953); *Roche v. Evaporated Milk Ass'n*, 319 U.S. 21, 30 (1943); *The Appellate Lawyer Representatives' Guide To Practice in the United States Court of Appeals for The Ninth Circuit*, 28 (June 2017 ed.) (“[T]he expense, delay, and annoyance of enduring the litigation through final judgment will not qualify as such a loss. . . .”).

8. There is no cognizable harm to Defendants in completing these limited pre-trial proceedings.

To the extent Defendants claim they will suffer some kind of hypothetical erosion of the separation of powers, trial itself will have no such effect. Olson Decl. ¶ 7. No order on liability or remedy has issued. Defendants can “pursue and vindicate [their] interests in the full course of this litigation” and appeal after final judgment.

East Bay Sanctuary Covenant v. Trump, ___ F.3d ___, 2018 WL 6428204 at *21 (9th Cir. Dec. 7, 2018) (citation and quotations omitted); *Id.* (“[I]t is the resolution of the case on the merits, not whether the injunction is stayed pending appeal, that will affect those [separation of powers and federalism] principles.”) (citation and quotations omitted).²³

Without a stay, Defendants argue, the United States and the public interest will be irreparably harmed because trial proceedings will move forward without allowing the opportunity for appellate review of the claims. ECF 419. This is simply

²³ See also Letter from Noel J. Francisco, Solicitor General, U.S. Dep’t of Justice, to Honorable Scott S. Harris, Clerk, Supreme Court of the United States, regarding *Department of Commerce, et al. v. United States District Court for the Southern District of New York, et al.*, No. 18-557 (Nov. 26, 2018), https://www.supremecourt.gov/DocketPDF/18/18-557/73266/20181126163620791_18-557%20Letter.pdf (Olson Decl. Exh. 3) (arguing even after final judgment, “in the government’s view . . . the Court still could order effective relief, including the exclusion of improperly admitted extra-record evidence and a prohibition on deposing Secretary Ross in any further proceedings.”).

untrue. As this Court has held, “[t]he government must be concerned not just with the public fisc but also with the public weal. In assessing this broader interest, we are not bound by the government’s litigation posture. Rather, we make an independent judgment as to the public interest.” *Lopez*, 713 F.2d at 1437. The government’s own climate assessments affirm that the public interest is not served by any further delay on efforts to redress the climate emergency. *See Valley v. Rapides Par. Sch. Bd.*, 118 F.3d 1047, 1056 (5th Cir. 1997) (“public interest would be undermined” were public entity’s “unconstitutional actions” allowed to stand); *see Lopez*, 713 F.2d at 1441 (J. Pregerson, concurring).

Defendants have not, and cannot, show that they would be unable to assert all of their arguments in the normal course of appellate review. None of the three levels of our federal judiciary has so found, and this Court has expressly found to the contrary. *In re United States*, 884 F.3d 830, 837 (9th Cir. 2018); *In re United States*, 895 F.3d 1101, 1106 (9th Cir. 2018). Defendants also cannot show that the typical expenses associated with complex civil litigation constitute irreparable harm. This Court has previously rejected this argument. *In re United States*, 884 F.3d at 836; *see also State of New York, et al., v. United States Department of Commerce, et al.*, No. 18-CV-2921, 2018 WL 6060304 at *1, 4 (S.D.N.Y. 2018) (litigation expense does not constitute irreparable injury and Department of Justice’s repetitive litigation conduct bordered on sanctionable) (citation omitted).

B. The Most Efficient Means to Move Forward is to Proceed to Trial

In light of the numerous stops and starts in this case and the ongoing harm to Plaintiffs, the most efficient way forward is for this Court to issue an order that clears this case for trial. Where urgent and lasting injunctive relief is needed, as it is here, a trial, rather than a preliminary injunction proceeding, is the most efficient course. ECF 100. This is particularly so when the parties are ready for trial and this Court issued its stay on the eve of trial. Olson Decl. ¶¶ 2, 20. If a stay continues pending full interlocutory appeal, it is likely to take at least six to nine months for briefing, oral argument, and a decision by this Court, and a similar amount of time on appeal to the Supreme Court before Plaintiffs could try their case, with parallel appellate proceedings on Plaintiffs' motion for injunctive relief pending appeal. Olson Decl. ¶ 18. At that point, the expert discovery would have to be entirely reconducted because of the scientific evidence on the catastrophic state of climate change in 2020. *Id.* ¶ 15. A stay of trial will compound emotional and physical harms suffered by Plaintiffs and ultimately increase the litigation burden on all parties with inefficient and duplicative review on appeal by the higher courts.

Moreover, in neither of the pending petitions do Defendants articulate any actual argument (beyond conclusory statements) as to why Plaintiffs' claims of infringement of well-established fundamental rights or of discrimination may not proceed even if this Court accepts interlocutory appeal or issues mandamus on

Plaintiffs' other claims. Consequently, these claims will survive and must be tried even if the other claims are dismissed on early review. This necessitates moving the proceedings forward expeditiously to adjudicate these matters even if the early appellate process remains underway.

V. IN THE ALTERNATIVE, PLAINTIFFS REQUEST THAT THIS COURT GRANT EXPEDITED CONSIDERATION OF DEFENDANTS' TWO PENDING PETITIONS.

Pursuant to Ninth Circuit Rule 27-12, this Court can expedite proceedings "upon a showing of good cause," which includes situations where, "in the absence of expedited treatment, irreparable harm may occur . . ." 9th Cir. Rule 27-12; *see Alliance for the Wild Rockies v. Salazar*, 2011 WL 3794399 (9th Cir. 2011) (granting motion to expedite); *United States v. Harris*, 846 F.2d 50 (9th Cir. 1988) (same). As explained in Section IV.A.1, the evidence demonstrates that Plaintiffs are, and will continue to be, irreparably harmed by any delay in the ultimate resolution of their case and the implementation of a remedy, should they succeed on the merits after trial. Accordingly, expedited consideration of Defendants' two pending Petitions is warranted to ensure the greatest likelihood of preventing irreparable harm to Plaintiffs.

VI. CONCLUSION

While Plaintiffs' pre-trial proceedings and trial have been stayed, Defendants have not ceased causing and contributing to climate change. The status quo of

discovery is not what needs protecting. These children need this Court's protection. The evidence shows, and Defendants' newest reports confirm, time is of the essence to protect Plaintiffs' constitutional rights from further infringement. Defendants admit “[w]ithout significant reductions in greenhouse gas emissions, extinctions and transformative impacts on some ecosystems **cannot be avoided**, with varying impacts on the economic, recreational and subsistence activities they support.” NCA4 Ch. 1, 51(emphasis added); *Id.* at Ch. 9, 367 (“losses of unique coral reef and sea ice ecosystems, can only be avoided by reducing carbon dioxide emissions”). Harms that “cannot be avoided” justify the lifting of the stay in this case.

This Court has jurisdiction and power to clear this case for trial. Defendants failed to satisfy *any* of the requirements warranting a stay and failed to proffer *any* legitimate harm that would necessitate a stay. This Court did not afford Plaintiffs an opportunity to oppose the stay nor conduct any analysis of the stay factors. Continuation of a stay will result in irrevocable harm to Plaintiffs and increased future litigation burdens, including the necessity of preliminary injunctive relief, creating multiple layers of appellate review and determinations of key factual issues without the benefit of live expert testimony at trial. Plaintiffs cannot continue to wait months, if not years, to get to trial while their injuries worsen and the window to redress the injuries closes. In the event this Court declines to clear this case for trial, Plaintiffs' respectfully request that this Court grant expedited review of Defendants'

two currently pending Petitions, giving Plaintiffs the opportunity to return to a course towards trial as quickly as possible. However, if this case is not cleared for trial, Plaintiffs will proceed on the less efficient and burdensome course of protecting their rights, indeed their lives, through an injunctive relief motion.

For the above-stated reasons, Plaintiffs respectfully request the Court to lift the stay in this case.

DATED this 20th day of December, 2018, at Eugene, OR.

Respectfully submitted,

s/ Julia A. Olson
JULIA A. OLSON
(OSB No. 062230, CSB No. 192642)
Wild Earth Advocates
1216 Lincoln Street
Eugene, OR 97401
Tel: (415) 786-4825

PHILIP L. GREGORY
(CSB No. 95217)
Gregory Law Group
1250 Godetia Drive
Redwood City, CA 94010
Tel: (650) 278-2957

ANDREA K. RODGERS
(OSB No. 041029)
Law Offices of Andrea K. Rodgers
3026 NW Esplanade
Seattle, WA 98117
Tel: (206) 696-2851

*Attorneys for Plaintiffs-Appellees and Real
Parties in Interest*

STATEMENT OF RELATED CASES

These cases were previously before this Court and each is a related case within the meaning of Circuit Rule 28-2.6: Defendants' four prior petitions for writs of Mandamus and a Petition for Permission to Appeal pursuant to 28 U.S.C. § 1292(b): *In re United States*, 884 F.3d 830 (9th Cir. 2018) (No. 17-71692); *In re United States*, 895 F.3d 1102 (9th Cir. 2018) (No. 18-71928); *In re United States*, No. 18-72776 (denied as moot Nov. 2, 2018); *In re United States*, No. 18-73014 (9th Cir. Nov. 5, 2018) (pending); and *Juliana v. United States*, No. 18-80176 (9th Cir. Nov. 30, 2018) (pending).

CERTIFICATE OF COMPLIANCE

I certify that this Emergency Motion contains 6,569 words, excluding the portions exempted by Federal Rules of Appellate Procedure 27(a)(2)(B) and 32(f), which is over the limit of 5,600 words established by Circuit Rules 27-1(1)(d) and 32-3(2). Plaintiffs file a Motion for an Overlength Brief herewith. The Motion's type size and type face comply with Federal Rule of Appellate Procedure 32(a)(5) and (6).

s/ Julia A. Olson

Julia A. Olson

Case No. 18-73014

**IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT**

KELSEY CASCADIA ROSE JULIANA, *et al.*,
Plaintiffs-Appellees,
v.
UNITED STATES OF AMERICA, *et al.*,
Defendants-Appellants.

On Petition For Permission to Appeal from the United States District Court for the
District of Oregon (No. 6:15-cv-01517-AA)

**DECLARATION OF JULIA A. OLSON IN SUPPORT OF PLAINTIFFS'
EMERGENCY MOTION UNDER CIRCUIT RULE 27-3 TO LIFT STAY
OR, ALTERNATIVELY, EXPEDITE REVIEW OF PETITIONS FOR
WRIT OF MANDAMUS (18-73014) AND PERMISSION FOR
INTERLOCUTORY APPEAL (18-80176)**

JULIA A. OLSON
(OSB No. 062230, CSB No. 192642)
Wild Earth Advocates
1216 Lincoln Street
Eugene, OR 97401
Tel: (415) 786-4825

PHILIP L. GREGORY
(CSB No. 95217)
Gregory Law Group
1250 Godetia Drive
Redwood City, CA 94062
Tel: (650) 278-2957

ANDREA K. RODGERS
(OSB No. 041029)
Law Offices of Andrea K. Rodgers
3026 NW Esplanade
Seattle, WA 98117
Tel: (206) 696-2851

*Attorneys for Plaintiffs-Appellees and Real
Parties in Interest*

I, Julia A. Olson, hereby declare and if called upon would testify as follows:

1. I am an attorney of record on behalf of Plaintiffs-Appellees in the above-entitled actions. I make this Declaration in support of Plaintiffs' Emergency Motion Under Circuit Rule 27-3 to Lift Stay or, Alternatively, Expedite Review of Petitions for Mandamus and Interlocutory Appeal. I have personal knowledge of the facts stated herein, except as to those stated upon information and belief and, if called to testify, I would and could testify competently thereto.
2. Discovery and pretrial matters before the district court in this case are almost entirely complete. As of the date of this Declaration, the only remaining discovery and pretrial matters are: (a) the depositions of two rebuttal and one sur-rebuttal experts (all in California) and five Plaintiffs (to be deposed in Eugene, Oregon around the time of the pretrial conference); and (b) completion of the briefing on the pending pretrial motions. The pending pretrial briefs include:
 - a. Plaintiffs' Reply to Motion for Reconsideration of Motion *in Limine* No 1, which is drafted;
 - b. Plaintiffs' Reply in Support of Motion *in Limine* No 3, which is drafted;

- c. Plaintiffs' Response to Defendants' Motion to Exclude Fact Witnesses, which is partially drafted;
 - d. Defendants' Reply in Support of Motion to Exclude Testimony of Six Experts; and
 - e. Defendants' Response to Plaintiffs' Objections to Defendants' Exhibit List.
3. None of these obligations, nor proceeding with trial, requires disclosure by Defendants of any confidential or privileged information nor requires Defendants to take any policy positions. The Joint Report on the Status of Discovery and Relevant Pretrial Matters filed with this Court on November 23, 2018 sets forth the remaining discovery and pretrial obligations in detail and is attached as **Exhibit 1** hereto.
4. The only current federal government employees who Plaintiffs intend to call as witnesses at trial, if any, are those witnesses that Defendants have identified as fact witnesses. Attached hereto as **Exhibit 2** is a true and correct copy of Defendant's Witness List, ECF 373. During a meet and confer with Plaintiffs' counsel on November 8, 2018, which I attended, counsel for Defendants stated that Defendants will call these witnesses at trial solely for the purpose of authenticating documents with the exception of one government witness, Dr. Michael Kuperberg, who Plaintiffs have already deposed. Neither side has

identified any high-level officials of the federal government to testify at trial. Both sides will present expert and fact witnesses at trial, but no high-level officials of the federal government remain to be deposed or will be called as witnesses at trial.

5. In opposing Plaintiffs' motion to lift the stay in the district court, Defendants argued there are seven possible additional depositions of Plaintiffs' fact witnesses, but never propounded any discovery regarding Plaintiffs' fact witnesses (apart from the youth Plaintiffs themselves) and have served no notices of deposition for those fact witnesses.
6. Plaintiffs do not seek to obtain or utilize confidential or privileged communications or documents of Defendants, either through discovery or at trial. While there is a protective order in the district court, *see* ECF 221, the only information that has been designated as confidential and subject to the protective order has been personal and health information concerning Plaintiffs.
7. Proceeding with trial would not lead to any separation of powers intrusions or institutional injury not correctable on appeal. Recently in a case with a procedural posture similar to the position advanced by Plaintiffs here, the Department of Justice asserted that, even after final judgment, "the Court still could order effective relief, including the exclusion of improperly admitted

extra-record evidence and a prohibition on deposing Secretary Ross in any further proceedings.” *See Exhibit 3*, a true and correct copy of the Letter from Noel J. Francisco, Solicitor General, U.S. Dep’t of Justice, to Honorable Scott S. Harris, Clerk, Supreme Court of the United States, regarding *Department of Commerce, et al. v. United States District Court for the Southern District of New York, et al.*, No. 18-557 (Nov. 26, 2018), attached hereto and available at: https://www.supremecourt.gov/DocketPDF/18/18-557/73266/20181126163620791_18-557%20Letter.pdf. Plaintiffs request judicial notice of this letter.

8. Ever since this case was filed over three years ago, Plaintiffs have worked as quickly and efficiently as possible to redress the climate emergency each of the youth Plaintiffs face, an emergency that is getting worse as each day passes. On November 28, 2016, less than three weeks after the district court denied Defendants’ motions to dismiss, the district court held a status conference to discuss pretrial proceedings. At that status conference, counsel for Plaintiffs informed the district court that any delay in getting to trial would necessitate a motion for preliminary injunction in light of the ongoing and irreparable harms being suffered by Plaintiffs. The transcript provides:

MS. OLSON: During our meet and confer, counsel for defendants indicated that they thought it would take five years to complete discovery and to get to trial, and we disagree with that. But there

are indications that the defendants are going to attempt to delay our getting to trial in this case. And, again, given the urgency, we attempted to engage in settlement discussions. We are willing to enter into the court's ADR program or have any other settlement negotiations that the defendants would be interested in. They have rejected those requests. They don't believe -- they can speak for themselves, but they have indicated to us they don't believe this case is appropriate for settlement talks. And given, again, the urgency, the plaintiffs have a need to seek preliminary relief in this case, and we would also like the court to set a hearing date for a motion for preliminary relief in early January.

THE COURT: Well, in the first place, you said a lot, and let me try to address it piecemeal, if I can. We are not going to take five years to try this case. That's not going to happen. We are going to set a discovery deadline that's going to be reasonable and not extended far out into the future, and everyone needs to understand that. And hopefully you folks can agree on a discovery schedule, but it sounds like you are pretty far apart and that's not going to happen, in which case, all the parties should submit their proposed schedule to the court, and the court will set a discovery deadline that is within reasonable parameters. The goal would be to set the discovery deadline and the motion practice, dispositive motions, *et cetera*, within a time period where a trial can be held by the middle or toward the fall of next year. With respect to your request to set a hearing for preliminary relief, I will tell you in all candor from where I sit in having dealt with this case, this does not seem to be a case that lends itself to the court fashioning some sort of relief without first having a trial in which all the issues are fleshed out. I mean, I am sitting here looking at Judge Aiken's order in this case, and since, in the absence of consents, she is going to be the one dealing with it, she says quite candidly in her order that, "In any event, speculation about the difficulty of crafting a remedy could not support dismissal at this early stage." And she goes on to quote from the *Baker* case, Supreme Court case, "It is improper now to consider what remedy would be most appropriate if appellants prevail at trial." So given the complexity of this case, it's extremely difficult for me to imagine a prospect for the court to jump ahead in January without the benefit of a trial and craft

some sort of preliminary relief and thus put the cart before the horse completely.

MS. OLSON: Thank you, Your Honor. This is Julia Olson again. And if we can get to trial by the middle to late time frame of 2017 that Your Honor suggested, then we could potentially hold off seeking preliminary relief. And just to be clear about the intention, the intention is to ensure that there is not further backsliding in terms of increasing emissions in the United States; that the defendants aren't continuing to promote and develop more fossil fuels and more fossil fuel infrastructure during the [time]frame that it takes to get to trial because of the fact that it locks in additional carbon dioxide and other greenhouse gas pollution that has threatened these plaintiffs. We are attempting to hold as much of the status quo as possible.

THE COURT: All right. I understand the plaintiffs' position.

ECF 100, at 10:22–13:17. Since this Status Conference, over two years have passed and Plaintiffs have still been unable to get the merits of their constitutional claims heard, a direct result of the repeated attempts by Defendants to delay trial.

9. This denial of justice has occurred in spite of the fact that Defendants have continued their unconstitutional conduct that threatens Plaintiffs' lives and liberties, in spite of the fact that Plaintiffs have prevailed on every one of Defendants' motions or petitions for dismissal, judgment, mandamus, and permanent stays of litigation for the past three years, at all three levels of the federal judiciary, often simultaneously, and in spite of the fact that Plaintiffs are ready to try their case.

10. The procedural history in this case is one of numerous stops and starts and has required Plaintiffs to expend extraordinary time and effort in responding to Defendants' repeated efforts to deny the youth Plaintiffs a trial in their constitutional case. Because of these repeated delays, Plaintiffs are being put in the position of having to seek preliminary injunctive relief to protect themselves from Defendants' continued unconstitutional conduct. It would be far more efficient and economical for the courts and the parties to allow the case to proceed to trial on the merits so that, if Plaintiffs prevail, a final remedy can be ordered and the appellate courts can review the case on a fully developed factual record.

11. On November 23, 2018, after the district court issued its order certifying four orders for interlocutory appeal and staying all proceedings, Defendants released the Fourth National Climate Assessment, USGRCP, 2018: *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment, Volume II*, U.S. Glob. Change Research Program, available at: <https://www.globalchange.gov/nca4>, a comprehensive report on climate change and its impacts in the United States. Counsel for Plaintiffs have spent considerable time reviewing this scientific report of the federal government. Given the length of this federal government report and its interactive nature,

Plaintiffs are not attaching this report to this Declaration but request this Court take judicial notice of this report.

12. On the same day, Defendants released the Second State of the Carbon Cycle Report, U.S. Glob. Change Research Program, *Second State of the Carbon Cycle Report: A Sustained Assessment Report* (2018), https://carbon2018.globalchange.gov/downloads/SOCCR2_2018_FullReport.pdf. The Second State of the Carbon Cycle Report focuses on the carbon cycle across the United States, Mexico, and Canada and assesses major elements of the global carbon cycle and key interactions with climate forcing and feedback components. Counsel for Plaintiffs have spent considerable time reviewing this scientific report of the federal government. Given the length of this federal government report and its interactive nature, Plaintiffs are not attaching this report to this Declaration but request this Court take judicial notice of this report.

13. In November 2018, the United States Geological Survey issued a report estimating greenhouse gas emissions associated with the extraction and use of fossil fuels from Federal lands, as well as estimates of ecosystem carbon emissions and sequestration on those lands. A true and correct copy of this report is attached hereto as **Exhibit 4** (Merrill, M.D., Sleeter, B.M., Freeman, P.A., Liu, J., Warwick, P.D., and Reed, B.C., 2018, *Federal lands greenhouse*

gas emissions and sequestration in the United States—Estimates for 2005–14: U.S. Geological Survey Scientific Investigations Report 2018–5131, 31 p., <https://doi.org/10.3133/sir20185131>). Plaintiffs request that this Court take judicial notice of this report.

14. In December 2018, Defendant NOAA issued its 2018 Arctic Report Card that tracks recent environmental changes in the Arctic relative to historical records. The 2018 Arctic Report Card can be accessed at: <https://www.arctic.noaa.gov/report-card>. Plaintiffs request that this Court take judicial notice of this report.
15. The complaint in this case was filed in August 2015, more than three years ago. More months of delay in this case will lead to the need for supplementation of expert reports, due to the constantly growing body of scientific information on climate change that is pertinent to expert testimony in this case. That in turn could lead to Defendants seeking to re-depose Plaintiffs' experts, which they have indicated they would seek to do in the event Plaintiffs tender supplemental reports. Audiovisuals, including spatial analysis, 3D modeling, and animation demonstratives and other exhibits which Plaintiffs prepared for an October 29 trial, may become outdated as carbon dioxide levels continue to rise dramatically, climate impacts worsen, and the very harms suffered by the youth Plaintiffs continue to grow, requiring

new factual documentation so that the district court has the most up to date evidence at trial and this Court has a full factual record to inform its review after final judgment.

16. Defendants have repeatedly presented materially identical legal arguments in successive, duplicative motions and petitions in contravention of the final judgment rule in all three tiers of the federal judiciary, leading to gross inefficiencies and prejudicial delay to Plaintiffs. A chart demonstrating Defendants' repeated, successive attempts to present the same issues in these filings is attached hereto as **Exhibit 5.**

17. Defendants have moved for a stay in this case a total of twelve times between the district court, this Court, and the Supreme Court. A timeline of Defendants' motions for stay is attached hereto as **Exhibit 6.** The stay applications and motions to this Court and the Supreme Court have been accompanied by repetitive petitions for the extraordinary remedy of writs of mandamus. Today, SCOTUSblog described the significant uptick in the use of these extraordinary tools by this Department of Justice, questioning their propriety. Steve Vladeck, *Power Versus Discretion: Extraordinary Relief and the Supreme Court*, SCOTUSblog (Dec. 20, 2018, 3:29 PM), <http://www.scotusblog.com/2018/12/power-versus-discretion-extraordinary-relief-and-the-supreme-court/>.

18. To illustrate the prejudicial delay and the gross inefficiency of any further stay of pretrial or trial proceedings, I had prepared the attached chart, Exhibit 7, which depicts a projected timeline to trial and appellate review if the stays are lifted (Path A) and if the case remains stayed and is reviewed on interlocutory appeal under 28 U.S.C. § 1292(b) (Path B). The chart depicts an expedited schedule in this Court in Path B for interlocutory appeal, consistent with Plaintiffs' request that, should this Court decline to lift its stay and decline to recommend the district court lift its stay, this Court expedite review of Defendants' two petitions pending in this Court, Ct. App. IV. Doc. 1-2, Ct. App. V Doc. 1-1, and any further review pursuant to 28 U.S.C. § 1292(b). The chart also assumes that, should this Court grant Defendants' Petition for Permission for Interlocutory Appeal under 28 U.S.C. § 1292(b), Ct. App. V. Doc. 1-1, the Supreme Court would issue a writ of certiorari, and maintain a stay of trial proceedings, to review this Court's substantive decision on interlocutory appeal before remanding back to the district court for trial. If this Court expedited interlocutory review, lifted the stay after interlocutory review, and the Supreme Court did not grant Defendants a stay pending its review (or denied review), then trial could commence sooner, but still not likely until 2020. Under the Path B scenario, each court could realistically be presented with three separate appellate processes (in addition to those which

have already occurred under Defendants' previous petitions for early review) before the conclusion of the case whereas under the Path A scenario there would be only one final appellate review by each court.

19. In comparison to the protracted early appellate process likely to ensue from interlocutory appeal, the parties currently anticipate a trial lasting 8-10 weeks. In terms of scheduling the length of trial, at a meet and confer session with Defendants' counsel on April 11, 2018, counsel for Plaintiffs initially projected 20 days for their case in chief. Defendants' counsel stated that it would be better for the parties to ask for more time than less at trial. Thus, as a result of that meet and confer session, the parties agreed to jointly request 50 trial days. The next day, at the April 12 Status Conference, counsel for Defendants confirmed the parties' agreement on 5 weeks per side with the district court. *See Transcript of Proceedings, ECF 191 at 7:19-8:7.*
20. Plaintiffs have incurred significant litigation costs to be prepared to commence trial as it was scheduled on October 29, 2018 and continue to incur significant litigation costs in order to be prepared to commence trial as soon as possible.
21. On November 5, 2018, Defendants moved for a stay before this Court. Ct. App. IV Doc. 1-2. Pursuant to Rule 27(a)(3)(A), Plaintiffs had until November 15, 2018 to oppose Defendants' motion for a stay. However, this Court issued

the stay on November 8, before Plaintiffs had an opportunity to file their brief in opposition.

22. Plaintiffs' counsel have worked diligently to move this case promptly to trial and to respond swiftly to the derailment of trial that occurred ten days before it was set to start.
- a. Plaintiffs filed their Response in opposition to Defendants' stay application in the Supreme Court prior to the deadline, on October 22, 2018.
 - b. Plaintiffs filed their Opposition to Defendants' Motions for Reconsideration on Interlocutory Appeal and to Stay the Litigation on November 9, only four days after those motions were filed.
 - c. Plaintiffs filed their Response in opposition to Defendants' Petition for Writ of Mandamus to this Court earlier than ordered, on November 18.
 - d. Plaintiffs filed their Response in opposition to Defendants' Petition for Writ of Mandamus in the Supreme Court on November 19.
 - e. Plaintiffs drafted, worked with opposing counsel, and filed the Joint Status Report to this Court as ordered on November 23.
 - f. Plaintiffs filed a Motion for Reconsideration to the district court to lift the stay on December 5.

- g. Plaintiffs filed their opposition to Defendants' Petition for Permission to Interlocutory Appeal with this Court on December 10.
 - h. Plaintiffs' counsel have since been preparing this Motion to this Court to lift the stay, while methodically working with Plaintiffs and their experts to prepare for an injunctive relief motion and a reply to Defendant's opposition to lifting the stay in the district court. ECF 449.
 - i. Plaintiffs' counsel have worked nearly every day since September in preparing for trial, opposing Defendants' various motions, petitions, and applications, and now preparing motions for relief to protect the rights of these young people. In so doing, Plaintiffs' counsel seek to use the most efficient and effective tools to secure the best remedy for these youth. As a result, Plaintiffs' counsel has chosen to begin with the least intrusive mechanisms first of respectfully asking the courts to lift the unnecessary stays of proceedings. However, Plaintiffs will resort to emergency injunctive relief should their other efforts fail. Plaintiffs are diligently preparing that motion.
23. Pursuant to Ninth Cir. R. 27, counsel for Plaintiffs contacted counsel for Defendants via email on December 19, 2018 to determine the position of Defendants. Counsel for Defendants communicated that they oppose this Motion, but do not oppose Plaintiffs' motion for an overlength brief.

I declare under penalty of perjury under the laws of the United States of America
that the foregoing is true and correct. Executed on December 20, 2018.

/s/ Julia A. Olson
JULIA A. OLSON

Exhibit 1

No. 18-73014

UNITED STATES COURT OF APPEALS FOR THE NINTH CIRCUIT

In re UNITED STATES OF AMERICA, et al.

UNITED STATES OF AMERICA, et al., Petitioners,

v.

UNITED STATES DISTRICT COURT FOR THE DISTRICT OF OREGON,
Respondent,

and

KELSEY CASCADIA ROSE JULIANA, et al., Real Parties in Interest.

On Petition for a Writ of Mandamus to the United States District Court
for the District of Oregon (No. 6:15-cv-01517-AA)

**JOINT REPORT ON THE STATUS OF
DISCOVERY AND RELEVANT PRETRIAL MATTERS**

JULIA A. OLSON
(OSB No. 062230, CSB No. 192642)
Wild Earth Advocates
1216 Lincoln St.
Eugene, OR 97401
(415) 786-4825

PHILIP L. GREGORY (CSB No. 95217)
Gregory Law Group
1250 Godetia Drive
Redwood City, CA 94062
(650) 278-2957

ANDREA K. RODGERS (OR Bar 041029)
Law Offices of Andrea K. Rodgers
3026 NW Esplanade
Seattle, WA 98117
(206) 696-2851

Attorneys for Real Parties in Interest

This Court's Order of November 8, 2018 directed the parties within 15 days to "file a joint report on the status of discovery and any relevant pretrial matters." On November 21, 2018, the district court found that each of the factors set forth in 28 U.S.C. § 1292(b) have been met regarding the district court's "previously mentioned orders" (ECF Nos. 83, 172, 238, and 369), exercised its discretion to immediately certify this case for interlocutory appeal, and stayed this case pending a decision by this Court. ECF No. 444.

In light of the district court's actions, and given that Defendants are today filing a reply brief that suggests holding these mandamus proceedings in abeyance, Defendants believe that a joint report is no longer necessary or appropriate.* Nevertheless, Defendants have agreed to the following as an accurate statement of the status of discovery and other relevant pretrial matters. Plaintiffs believe the status of the case is still pertinent to the issues of mandamus and whether this Court should accept interlocutory appeal given the current posture of the proceedings below.

I. Status of discovery

A. Expert Reports

All expert reports of disclosed experts in this case have been served.

*At the specific request of counsel for Defendants, their names "do not appear on the document."

Pursuant to the district court's order, Plaintiffs served 17 expert reports for their 18 expert witnesses on Defendants on April 13, 2018. ECF No. 189. On August 10, 2018, Plaintiffs served the expert report of James Gustave Speth on Defendants.

Pursuant to the district court's order, Defendants disclosed the identity of their eight expert witnesses to Plaintiffs on July 12, 2018. ECF No. 192. On August 13, 2018, Defendants served their expert reports on Plaintiffs. *Id.*

On September 19, 2018, Plaintiffs served five rebuttal expert reports on Defendants, including two reports by two new rebuttal experts. ECF No. 337. On October 12, 2018, Defendants served a single sur-rebuttal expert report. On November 9, 2018, Defendants served two rebuttal expert reports to the expert report of James Gustave Speth.

B. Depositions

To date, the parties have completed 30 expert depositions: 22 depositions of Plaintiffs' 21 expert witnesses (one was deposed twice) and eight depositions of Defendants' eight expert witnesses. The only remaining expert depositions of disclosed experts are of three of Defendants' experts, one of whom served a sur-rebuttal report and two of whom served rebuttal reports in response to one of Plaintiffs' experts. Thus, all depositions of the parties' disclosed experts have been taken or will be taken if and when the current stay is lifted.

In addition, Defendants have deposed 15 of the 21 Youth Plaintiffs. There remain nine additional depositions as described below:

- Defendants' expert Dr. Jeffrey Sugar, regarding his sur-rebuttal expert report.
- Defendants' expert Dr. James Sweeney, regarding his rebuttal expert report.
- Defendants' expert Dr. David Victor, regarding his rebuttal expert report.
- Plaintiff Nathaniel B.
- Plaintiff Kiran Issac Oommen.
- Plaintiff Sahara V.
- Plaintiff Journey Z.
- Plaintiff Levi D.
- Plaintiff Jaime B.: There are no plans to depose this Plaintiff as Plaintiffs have indicated that this Plaintiff is currently unavailable to testify at trial. If Plaintiffs decide that this Plaintiff will testify at trial, Defendants will notice this Plaintiff's deposition.

As discussed below, Defendants have moved to exclude the following witnesses, identified on October 15, 2018. If the witnesses are not excluded, Defendants will notice their depositions. These witnesses were designated as fact witnesses by Plaintiffs on their Witness List. ECF No. 387. Specifically:

- Plaintiffs' witness Jamescita Peshlakai (mother of Plaintiff Jaime B.) or Mae Peshlakai (grandmother). Plaintiffs have indicated that only one of these witnesses will testify.
- Plaintiffs' witness Sharon Baring, mother of Plaintiff Nathaniel B.
- Plaintiffs' witness Marie Venner, mother of Plaintiff Nick V.

- Plaintiffs' witness Leigh-Ann Draheim, mother of Levi D.
- Plaintiffs' witness Jessica Wentz, Sr. Fellow & Associate Researcher, Sabin Center for Climate (Columbia University).
- Plaintiffs' witness Stephen Seidel, a former employee of the Council on Environmental Quality and of the Environmental Protection Agency.
- Plaintiffs' witness Susan Ying, who worked in aerospace and aeronautical industries.

Rule 30(b)(6) Depositions: Pursuant to Federal Rule of Civil Procedure 30(b)(6), Plaintiffs served deposition notices on the Departments of Agriculture (May 4, 2018), Interior (May 4, 2018), Transportation (May 11, 2018), Defense (June 4, 2018), and Energy (June 4, 2018). The parties agreed to hold these depositions in abeyance while they pursued interrogatories. Plaintiffs no longer intend to pursue their pending Rule 30(b)(6) depositions.

C. Interrogatories

Both Plaintiffs and Defendants have served interrogatories, and both parties have responded to the interrogatories. Both parties have also indicated an intent to provide supplemental responses to certain interrogatories.

As discussed below, Plaintiffs have moved to compel responses to the interrogatories that Plaintiffs served on Defendants. Both the motion and the response have been filed in the district court.

D. Requests for Admission

Plaintiffs served Requests for Admission (“RFAs”) on the Departments of Agriculture (May 4, 2018), Interior (May 4, 2018), Transportation (May 11, 2018), Defense (June 4, 2018), and Energy (June 4, 2018). The parties agreed to hold the RFAs in abeyance until the district court decides Plaintiffs’ motions for judicial notice, which are listed below. Plaintiffs do not intend to pursue their pending RFAs.

E. Protective Orders

Defendants have sought two protective orders in this case. ECF Nos. 196, 217. Defendants’ first motion for a protective order, which sought to preclude all discovery in this action, was filed on May 9, 2018; that motion was denied by the district court. ECF Nos. 212, 300.

Defendants’ second motion for a protective order, which sought relief from Rule 30(b)(6) depositions and RFAs, was filed on June 4, 2018 and held in abeyance by the district court upon agreement of the parties. ECF No. 249. Plaintiffs will not pursue their pending Rule 30(b)(6) depositions or their pending RFAs, and as such, Defendants’ second motion for a protective order is moot.

To avoid protracted discovery and to simplify authentication of government records, and based upon guidance from the district court, Plaintiffs moved for judicial notice of publicly available documents, largely including documents generated by Defendants. ECF Nos. 254, 340, 380. Defendants have also filed a

motion seeking judicial notice of 456 Congressional Hearing Reports comprising over 80,000 pages of material. ECF No. 375. Plaintiffs did not oppose this motion. The parties agreed to substitute contention interrogatories in lieu of Rule 30(b)(6) depositions. ECF No. 389, ¶¶ 6-7.

Other than what has been described above, no further discovery is anticipated by the parties.

II. Status of pretrial motion practice

A. Pending motions

The following 14 motions are either fully briefed and pending a decision by the district court or are currently being briefed by the parties.

- On June 4, 2018, Defendants filed a Motion for Protective Order seeking relief from Plaintiffs' Requests for Admission (RFAs) and Rule 30(b)(6) depositions. ECF No. 217. On June 27, 2018, the district court ordered that this motion should be held in abeyance "until the Court decides Plaintiffs' motions to seek judicial notice of the documents referenced in Requests for Admissions and to give the parties the opportunity to reach agreement on substituting contention interrogatories for the pending Rule 30(b)(6) depositions." ECF No. 249. Plaintiffs no longer intend to pursue Rule 30(b)(6) depositions or RFAs.
- On August 24, 2018, Plaintiffs filed a Second Motion *in Limine* seeking judicial notice of 609 documents, together with a supporting declaration. ECF Nos. 340, 341. Defendants filed a response on September 28, 2018. ECF No. 357. Plaintiffs filed a reply on October 12, 2018. ECF No. 366.
- On October 15, 2018, Defendants filed a Motion *in Limine* to exclude the testimony of six of Plaintiffs' scientific experts. ECF No. 371. Plaintiffs filed an opposition and a declaration in support on November 2, 2018. ECF Nos. 409, 410. On November 15, 2018, Defendants filed a motion seeking an extension of time until November 23, 2018 to respond. ECF No. 434.

- On October 15, 2018, Defendants filed a Motion *in Limine* to strike the rebuttal report and exclude the testimony of Dr. Akilah Jefferson. ECF No. 372. Plaintiffs filed an opposition and a supporting declaration on November 2, 2018. ECF Nos. 407, 408. Defendants filed a reply on November 16, 2018. ECF No. 436.
- On October 15, 2018, Defendants filed a Request for Judicial Notice of 446 Congressional hearing reports. ECF No. 375. On November 2, 2018, Plaintiffs filed a response indicating they do not oppose the motion. ECF No. 406. Defendants do not intend to file a reply.
- On October 15, 2018, Defendants filed a Motion *in Limine* to exclude the expert testimony of Plaintiffs' expert Professor Catherine Smith. ECF No. 379. Plaintiffs filed an opposition and a supporting declaration on November 6, 2018. ECF Nos. 421, 422. Defendants filed their reply on November 20, 2018. ECF No. 442.
- On October 15, 2018, Plaintiffs filed a Third Motion *in Limine* seeking judicial notice of 452 documents. ECF No. 380. Defendants filed a response on November 13, 2018. ECF No. 431. But for the stay, Plaintiffs' reply would have been due November 27, 2018.
- On October 17, 2018, Plaintiffs filed a Motion to Compel Responses to Interrogatories. ECF No. 388. On November 15, 2018, Defendants filed an opposition. ECF No. 433. Unless otherwise directed by the court, no reply is permitted under the Local Rules. LR 26-3(c).
- On October 18, 2018, Defendants filed a Motion to Strike Plaintiffs' proposed pretrial order. ECF No. 395. Plaintiffs filed a response on November 2, 2018. ECF No. 409. Defendants filed a reply on November 16, 2018. ECF No. 438.
- On October 19, 2018, Defendants filed a Motion to Strike Plaintiffs' Trial Exhibit List or, in the alternative, Objections to Plaintiffs' Trial Exhibit List. ECF No. 397. Plaintiffs filed an opposition on November 2, 2018. ECF No. 411. Defendants filed a reply on November 16, 2018. ECF No. 435.

- On November 2, 2018, Plaintiffs filed a Motion for Reconsideration of the district court's Opinion and Order on Plaintiffs' First Motion in Limine seeking judicial notice of 364 documents. ECF No. 415. Defendants filed a response on November 16, 2018. ECF No. 437. But for the stay, Plaintiffs' reply would have been due November 30, 2018.
- On November 5, 2018, Defendants filed a Motion to Reconsider the district court's denial of Defendants' previous requests to certify for Interlocutory Review its orders on Defendants' motions to dismiss and for judgment on the pleadings and summary judgment. ECF No. 418. Plaintiffs filed an opposition on November 9, 2018. ECF No. 428. Defendants filed a reply on November 14, 2018. ECF No. 432.
- On November 5, 2018, Defendants filed a Motion to Stay this litigation in the district court pending the district court's resolution of Defendants' Motion to Reconsider its denial of previous requests to certify its orders for interlocutory review or resolution of Defendants' Petition for Mandamus filed in the Ninth Circuit. ECF No. 419. Plaintiffs filed an opposition on November 9, 2018. ECF No. 429. But for the stay, Defendants' reply would have been due November 23.
- On November 20, 2018, Defendants filed a Motion to Exclude the testimony of seven witnesses identified by Plaintiffs in their Witness List filed on October 15, 2018, ECF No. 382, in accordance with the schedule set by the district court. ECF No. 440. But for the stay, Plaintiffs' response would have been due December 4, 2018.

B. Anticipated motions

Plaintiffs intend to file a motion for judicial notice of facts within approximately 20 authenticated government documents listed on Plaintiffs' Exhibit List.

III. Other relevant pretrial matters

On October 15, 2018, pursuant to the district court's order (ECF No. 343), the parties filed their witness lists (ECF Nos. 373, 382), trial memoranda (ECF Nos. 378,

384), and motions *in limine* (ECF Nos. 371, 372, 379, 380). On October 15, 2018, Plaintiffs filed a proposed pretrial order (ECF No. 383), which Defendants moved to strike on October 18, 2018 (ECF No. 395). On October 19, 2018, the parties filed their trial exhibit lists (ECF Nos. 396, 402) and their respective objections and motion to strike exhibits. (ECF Nos. 397, 400).

If and when the stay (ECF No. 444) is lifted, the parties will meet and confer with each other regarding objections to exhibit lists. ECF Nos. 400, 401, 423, 424. In addition, the parties have continued to narrow the exhibits intended to be presented at trial.

In response to the temporary stay ordered by the Supreme Court, the District Court vacated the pretrial conference set for October 23, 2018 and the trial date set for October 29, 2018. ECF Nos. 403, 404. On November 21, 2018, and pursuant to its Order certifying this case for interlocutory appeal, ECF No. 444, the District Court stayed consideration of pending motions in this case. ECF No. 445. Further, the district court denied Defendants' Motion for Reconsideration (ECF No. 418) and Motion for Stay (ECF No. 419) as moot. *Id.*

Dated: November 23, 2018.

/s/ Philip L. Gregory

PHILIP L. GREGORY (CSB No. 95217)
pgregory@gregorylawgroup.com
Gregory Law Group
1250 Godetia Drive
Redwood City, CA 94062
Tel: (650) 278-2957

JULIA A. OLSON
Wild Earth Advocates

ANDREA K. RODGERS
Law Offices of Andrea K. Rodgers
Attorneys for Real Parties in Interest

CERTIFICATE OF SERVICE

I hereby certify that I electronically filed the foregoing with the Clerk of the Court for the United States Court of Appeals for the Ninth Circuit by using the appellate CM/ECF system on November 23, 2018.

I further certify that all participants in the case are registered CM/ECF users and that service will be accomplished by the appellate CM/ECF system.

Respectfully submitted this 23rd day of November, 2018.

/s/ Philip L. Gregory
PHILIP L. GREGORY

Exhibit 2

JEFFREY H. WOOD
Acting Assistant Attorney General
Environment & Natural Resources Division

LISA LYNNE RUSSELL, Chief
GUILLERMO A. MONTERO, Assistant Chief
SEAN C. DUFFY (NY Bar. No. 4103131)
MARISSA A. PIROPATO (MA Bar. No. 651630)
CLARE BORONOW (admitted to MD bar)
FRANK J. SINGER (CA Bar No. 227459)
ERIKA NORMAN (CA Bar No. 268425)
Trial Attorneys
Natural Resources Section
601 D Street NW
Washington, DC 20004
Telephone: (202) 305-0445
Facsimile: (202) 305-0506
sean.c.duffy@usdoj.gov

Attorneys for Defendants

**UNITED STATES DISTRICT COURT
DISTRICT OF OREGON
EUGENE DIVISION**

KELSEY CASCADIA ROSE JULIANA, *et al.*, Case No. 6:15-CV-01517-TC

Plaintiffs,

DEFENDANTS' WITNESS LIST

v.

UNITED STATES OF AMERICA, *et al.*,

Defendants.

INTRODUCTION

Defendants maintain that this case should be dismissed. Defendants acknowledge that this Court has disagreed with Defendants' challenges, but respectfully reaffirm their position that this case is improper for several reasons. Among other things, Plaintiffs lack standing to bring this lawsuit, the Administrative Procedure Act requires Plaintiffs' lawsuit to challenge discrete government action or a discrete failure to act, which their complaint fails to do, Plaintiffs' claims infringe on legislative and executive functions that the Constitution assigns to the political branches, and the complaint fails to state legally cognizable theories of recovery. The Ninth Circuit and the Supreme Court contemplated a narrowing of this case before trial, which for the most part has not occurred. Trial is also improper because *de novo* proceedings are presumptively improper in cases governed by the APA's judicial review provisions. Defendants' compliance with Court orders, including the submission of a witness list, should not be viewed as a concession that trial is proper; nor should Defendants' compliance be viewed as a waiver of Defendants' objections to these proceedings.

Defendants intend to introduce the expert and fact witnesses listed below during trial. If called, the witnesses listed below will testify to the facts and opinions as delineated below. Depositions and other discovery are ongoing as of the date of this filing. Accordingly, Defendants reserve the right to supplement this list at a later date. Defendants also reserve the right to not call the witnesses listed below.

EXPERT WITNESSES

Howard Herzog: If called to testify, Mr. Herzog will offer the expert testimony that is memorialized in his expert report. Mr. Herzog's testimony rebuts the conclusion that it is both technologically and economically feasible to transition from a predominantly fossil fuel-based

energy system to a 100 percent renewable energy system for all energy sectors by 2050, with about 80 percent conversion by 2030.

Norman Klein: If called to testify, Dr. Klein will offer the expert testimony that is memorialized in his expert report. Dr. Klein's testimony elaborates on the standard of medical care applicable to Plaintiffs' allegations of respiratory health, and allergy issues. Dr. Klein's testimony further addresses Plaintiffs' experts' discussion of Plaintiffs' alleged respiratory health and allergy issues and climate change.

Arthur Partikian: If called to testify, Dr. Partikian will offer the expert testimony that is memorialized in his expert report. Dr. Partikian's testimony elaborates on the standard of medical care applicable to Plaintiffs' allegations of neurological harm. Dr. Partikian' testimony also addresses Plaintiffs' experts' discussion of Plaintiffs' alleged neurological harm and climate change.

Jeffrey Sugar: If called to testify, Dr. Sugar will offer the expert testimony that is memorialized in his expert report and expert rebuttal report. Dr. Sugar's testimony elaborates on the standard of medical care applicable to Plaintiffs' allegations of psychological harm. Dr. Sugar's testimony also addresses Plaintiffs' experts' discussion of Plaintiffs' alleged psychological harm and climate change.

Daniel Sumner: If called to testify, Dr. Sumner will offer the expert testimony that is memorialized in his expert report. Dr. Sumner's testimony evaluates the policy requirements, the feasibility, and the broader consequences of implementing the land management practices that Plaintiffs' experts' propose.

James Sweeney: If called to testify, Dr. Sweeney will offer the expert testimony that is memorialized in his expert report and expert rebuttal report. Dr. Sweeney will testify to the

objectives that are and have historically been balanced in formulating energy policy, the decarbonization of the U.S. economy over time, the role of federal policies and programs in the decarbonization of the U.S. economy over time, the role of federal policies and programs in the energy-related carbon intensity of the U.S. economy over time, the federal government's consideration of the policy proposals Plaintiffs and their experts propose, the relationship between the federal government's greenhouse gas emissions and Plaintiffs' alleged harms, and the technical feasibility and efficacy of Plaintiffs' experts' proposed changes to U.S. energy policy.

David Victor: If called to testify, Dr. Victor will offer the expert testimony that is memorialized in his expert report. Dr. Victor will assess Plaintiffs' experts' opinions on the U.S. share of greenhouse gas emissions and the feasibility of transitioning to a consumption-based accounting system. Dr. Victor will also address the impacts that Plaintiffs' experts' proposed reforms to fossil fuel subsidies and leases would have on greenhouse gas emissions. And Dr. Victor will address Plaintiffs' experts' conclusions on the federal government's role in the use of fossil fuels in the U.S. economy and the United States' need to engage international trading partners to adopt meaningful policy interventions to address climate change.

John Weyant: If called to testify, Dr. Weyant will offer the expert testimony that is memorialized in his expert report. Dr. Weyant will address the scope of conclusions on attribution and the results of different climate modeling runs that explore different U.S. emission scenarios.

FACT WITNESSES

Rebecca Patton: If called to testify, Ms. Patton will offer testimony to authenticate documents on behalf of the United States Department of Defense and other testimony in relation to those documents.

Marissa McInnis: If called to testify, Ms. McInnis will offer testimony to authenticate documents on behalf of the United States Department of Defense and other testimony in relation to those documents.

Kathleen White: If called to testify, Ms. White will offer testimony to authenticate documents on behalf of the United States Department of Defense and other testimony in relation to those documents.

Jerry Drake: If called to testify, Mr. Drake will offer testimony to authenticate documents on behalf of the United States Department of State and other testimony in relation to those documents.

Eric Boyle: If called to testify, Mr. Boyle will offer testimony to authenticate documents on behalf of the United States Department of Energy and other testimony in relation to those documents.

William Hohenstein: If called to testify Mr. Hohenstein will offer testimony to authenticate documents on behalf of the United States Department of Agriculture and other testimony in relation to those documents.

Daniel Conrad: If called to testify, Mr. Conrad will offer testimony to authenticate documents on behalf of the United States Environmental Protection Agency and other testimony in relation to those documents.

Howard C. Sun: If called to testify, Mr. Sun will offer testimony to authenticate documents on behalf of the United States Council on Environmental Quality and other testimony in relation to those documents.

Benjamin Simon: If called to testify, Mr. Simon will offer testimony to authenticate documents on behalf of the United States Department of the Interior and other testimony in relation to those documents.

William Sweet, Ph.D.: If called to testify, Mr. Sweet will offer testimony to authenticate documents on behalf of the United States Department of Commerce and other testimony in relation to those documents.

Michael Kuperberg, Ph.D.: If called to testify, Dr. James Michael (“Michael”) Kuperberg will offer testimony to authenticate documents on behalf of the United States Office of Science and Technology Policy. In addition, Dr. Kuperberg will offer testimony to authenticate documents on behalf of the United States Global Change Research Program (USGCRP) and other testimony in relation to those documents.

Darren Timothy: If called to testify, Mr. Timothy will offer testimony to authenticate documents on behalf of the United States Department of Transportation and other testimony in relation to those documents.

Cheryl MacKay: If called to testify, Ms. MacKay will offer testimony to authenticate congressional documents on behalf of the United States as well as a summary of those documents pursuant to Fed. R. Evid. 1006.

Dated: October 15, 2018

Respectfully submitted,

JEFFREY H. WOOD
Acting Assistant Attorney General
Environment & Natural Resources Division

/s/ Sean C. Duffy

LISA LYNNE RUSSELL
GUILLERMO A. MONTERO
SEAN C. DUFFY (NY Bar No. 4103131)
MARISSA PIROPATO (MA Bar No. 651630)
CLARE BORONOW (admitted to MD bar)
FRANK J. SINGER (CA Bar No. 227459)
ERIKA NORMAN (CA Bar No. 268425)
U.S. Department of Justice
Environment & Natural Resources Division
Natural Resources Section
601 D Street NW
Washington, DC 20004
Telephone: (202) 305-0445
Facsimile: (202) 305-0506
sean.c.duffy@usdoj.gov

Attorneys for Defendants

Exhibit 3

**U.S. Department of Justice**

Office of the Solicitor General

Washington, D.C. 20530

November 26, 2018

Honorable Scott S. Harris
Clerk
Supreme Court of the United States
Washington, D.C. 20543

Re: Department of Commerce, et al. v. United States District Court for the Southern District of New York, et al., No. 18-557

Dear Mr. Harris:

The petition for a writ of certiorari in the above-captioned case was granted on November 16, 2018, and the Court will hear argument on February 19, 2019. In light of the Court's grant of certiorari, the government respectfully suggests that the Court may wish to reconsider staying further trial proceedings, which are ongoing. Although entry of a final judgment in the district court would not, in the government's view, moot the question presented in the petition, a stay would avoid the need to litigate mootness and would protect this Court's jurisdiction to review the issue on which it granted certiorari.

1. This case involves challenges to the decision by Secretary of Commerce Wilbur L. Ross, Jr. to reinstate to the decennial census a question asking about citizenship, as had been asked of at least a sample of the population on every decennial census from 1820 to 2000 (except in 1840). See 315 F. Supp. 3d 766, 776-777. Finding respondents to have made a "strong showing" that Secretary Ross acted in "bad faith" in reinstating the question, the district court in a series of orders permitted respondents to seek discovery outside the administrative record to probe the Secretary's mental processes, and eventually compelled the depositions of two high-level Executive Branch officials: Acting Assistant Attorney General (AAG) John M. Gore and Secretary Ross himself. See Pet. App. 9a-23a, 24a-27a, 93a-100a.

2. a. On October 22, 2018, this Court stayed the district court's order compelling the deposition of Secretary Ross. 18A375 slip op. 1. That stay "will remain in effect until disposition of [the government's] petition [for a writ of certiorari] by this Court." *Ibid.* The Court declined to stay the district court's orders compelling the deposition of Acting AAG Gore and allowing discovery beyond the administrative record, but made clear that the denial "[did] not preclude the applicants from making arguments with respect to those orders" in its petition for a writ of certiorari. *Ibid.* Justice Gorsuch, joined by Justice Thomas, would have taken "the next logical step and

simply stay[ed] all extra-record discovery pending [this Court's] review." *Id.* at 3. Among the reasons "weighing in favor of a more complete stay" was "the need to protect the very review [this Court] invite[s]." *Ibid.*

b. The district court did not stay the trial, in part because this Court had stayed only the deposition of Secretary Ross and not the district court's order "authorizing extra-record discovery in the first place." 18-cv-2921 D. Ct. Doc. 405, at 7 (Oct. 26, 2018) (Pet. App. 118a), as amended, D. Ct. Doc. 485, at 7 (Nov. 5, 2018). The Second Circuit declined to stay the trial in a summary order. 18-2856 C.A. Doc. 75 (Oct. 26, 2018).

c. On November 2, 2018, this Court denied the government's application to expand the stay to include a stay of the trial. 18A455 Order. Justice Thomas, Justice Alito, and Justice Gorsuch would have granted the application. *Ibid.* A bench trial commenced on November 5, the taking of evidence closed on November 16, and post-trial briefs were submitted on November 21. Closing arguments will be held tomorrow, November 27.

3. a. On November 16, 2018, this Court granted the government's petition for a writ of certiorari. The case is set for oral argument on February 19, 2019, following an expedited briefing schedule. The question presented in the petition is not limited to the deposition of Secretary Ross, but encompasses all "discovery outside the administrative record to probe the mental processes of the agency decisionmaker." Pet. I.

b. In light of this Court's grant of certiorari and its expedition of the briefing and argument schedule, the government moved the district court to stay further trial proceedings. 18-cv-2921 D. Ct. Doc. 540 (Nov. 18, 2018). The district court denied the motion. 18-cv-2921 D. Ct. Doc. 544 (Nov. 20, 2018). The court did not believe that this Court's grant of the government's petition for a writ of certiorari constituted a "significant change in circumstances" to warrant reconsideration of its previous denial. *Id.* at 2-3 (citation omitted). And the court concluded that its entry of final judgment before this Court's review "would aid, not hinder, the Supreme Court's task—as the Supreme Court may be able to avoid deciding a thorny legal question altogether." *Id.* at 4.

c. The Second Circuit declined to stay further trial proceedings "substantially for the reasons set forth in the District Court's brief opinion." 18-2856 C.A. Doc. 93 (Nov. 21, 2018).

* * * * *

In light of this Court's grant of the government's petition for a writ of certiorari, the government respectfully suggests that the Court may wish to reconsider staying further trial proceedings. A stay of further trial proceedings could "protect the very review [this Court] invite[d]" and has now granted. 18A375 slip op. 3 (opinion of Gorsuch, J.). A stay pending the disposition of a petition for a writ of certiorari is

appropriate if there is (1) “a reasonable probability that four Justices will consider the issue sufficiently meritorious to grant certiorari”; (2) “a fair prospect that a majority of the Court will conclude that the decision below was erroneous”; and (3) “a likelihood that irreparable harm will result from the denial of a stay.” *Conkright v. Frommert*, 556 U.S. 1401, 1402 (2009) (Ginsburg, J., in chambers) (citation, brackets, and internal quotation marks omitted). If the first factor was debatable before, it is clear now. The Court has granted review of the government’s petition, which encompasses all of the extra-record discovery. And the Court’s stay of Secretary Ross’s deposition indicates a fair prospect of reversal on at least a portion of the question presented.

The third factor of irreparable harm also supports a stay. Absent a stay, entry of a final judgment by the district court before this Court has conducted its review could threaten this Court’s jurisdiction to decide the question presented. See 18-cv-2921 Doc. 544, at 4 (district court’s belief that if trial proceedings continue “the Supreme Court may be able to avoid deciding a thorny legal question altogether”). Ordinarily, when “the normal course of appellate review might otherwise cause the case to become moot,’ issuance of a stay is warranted.” *Garrison v. Hudson*, 468 U.S. 1301, 1302 (1984) (Burger, C.J., in chambers) (citation omitted). Issuing a stay here would protect this Court’s review of the question presented.

The government recognizes that the Court may well have considered this risk in declining to stay trial proceedings in the November 2 order. See 18A455 Order. And in the government’s view, the district court’s entry of a final judgment would not moot the case because the Court still could order effective relief, including the exclusion of improperly admitted extra-record evidence and a prohibition on deposing Secretary Ross in any further proceedings. Nevertheless, now that the Court has granted review, a stay of further trial proceedings would protect that review and avoid collateral litigation before this Court over whether that review has been mooted.

Respondents would not suffer irreparable harm if further trial proceedings were stayed. The relief they seek is to exclude the citizenship question from the decennial census questionnaire, which will not be printed until at least next summer. This Court’s expedited review of the government’s petition ensures a decision in advance of that date, allowing enough time for the district court to issue its final decision thereafter. To be sure, a full round of appellate review of the district court’s final decision on the merits might not be possible to complete before next summer—but that would be true even absent a stay. A stay, however, would ensure that the final judgment is actually final, because it would be based only on the evidence this Court rules is properly considered. That judgment might then be affirmed (if correct) or reversed (if not), but at least would not have to be redone.

For these reasons, the government respectfully suggests that the Court may wish to reconsider staying further trial proceedings in light of its grant of the government’s petition for a writ of certiorari.

Sincerely,

Noel J. Francisco
Solicitor General

encl.: District court opinion and order denying a stay of trial (Nov. 20, 2018)
Second Circuit order denying a stay of trial (Nov. 21, 2018)

cc: See Attached Service List

18-0557

IN RE UNITED STATES DEPARTMENT OF
COMMERCE, ET AL.

-

JOHN ARK FREEDMAN
ARNOLD & PORTER LLP
601 MASSACHUSETTS AVENUE, NW
WASHINGTON, DC 20001
JOHN_FREEDMAN@APORTER.COM

MICHAEL J. MONGAN
CALIFORNIA DEPARTMENT OF JUSTICE
455 GOLDEN GATE AVE.,
SUITE 11000
SAN FRANCISCO, CA 94102
415-703-2548
MICHAEL.MONGAN@DOJ.CA.GOV

KAYLAH L. PHILLIPS
PUBLIC INTEREST LEGAL FOUNDATION
32 E. WASHINGTON, SUITE 1675
INDIANAPOLIS, IN 46204
317-203-5599
KPHILLIPS@PUBLICINTERESTLEGAL.ORG

BARBARA UNDERWOOD
STEVEN WU
NY STATE OFFICE OF THE ATTORNEY
GENERAL
28 LIBERTY STREET
23RD FLOOR
NEW YORK, NY 10005
BARBARA.UNDERWOOD@AG.NY.GOV

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

	X
STATE OF NEW YORK, et al.,	:
Plaintiffs,	:
	18-CV-2921 (JMF)
-v-	:
UNITED STATES DEPARTMENT OF COMMERCE, et al.,	: MEMORANDUM <u>OPINION AND ORDER</u>
Defendants.	:
	:
	X

JESSE M. FURMAN, United States District Judge:

These consolidated cases involve a challenge to Secretary of Commerce Wilbur L. Ross, Jr.'s decision to reinstate a question about citizenship status to the 2020 census questionnaire. Defendants, through their attorneys at the Department of Justice, have tried and failed repeatedly to halt the orderly progress of this litigation.¹ Their latest and strangest effort is a motion to stay all further proceedings, including entry of final judgment, pending the Supreme Court's

¹ Indeed, as Plaintiffs note, since the eve of Labor Day Weekend, Defendants have filed in this Court, the Second Circuit, or the Supreme Court "an astonishing twelve requests to delay these proceedings" — "an average of a request to delay filed each and every single week from Labor Day to Thanksgiving." (Docket No. 543 ("Pls.' Opp'n"), at 1). With one narrow exception — the stay Defendants obtained from the Supreme Court of this Court's Order authorizing a deposition of Secretary Ross, *see In re Dep't of Commerce*, — S. Ct. —, No. 18A375, 2018 WL 5259090 (U.S. Oct. 22, 2018) — every one of those requests has been rejected. *See New York v. United States Dep't of Commerce*, — F. Supp. 3d —, No. 18-CV-2921 (JMF), 2018 WL 4279467 (S.D.N.Y. Sept. 7, 2018) (denying a stay of the deposition of the Acting Assistant Attorney General and all discovery); *In re U.S. Dep't of Commerce*, No. 18-2652, 2018 WL 6006904 (2d Cir. Sept. 25, 2018) (same); *In re Dep't of Commerce*, 2018 WL 5259090 (same); *New York v. U.S. Dep't of Commerce*, No. 18-CV-2921 (JMF), 2018 WL 5307097 (S.D.N.Y. Oct. 26, 2018), as amended, 2018 WL 5791968 (Nov. 5, 2018) (denying a stay of pretrial proceedings and trial); *In re United States Dep't of Commerce*, Nos. 18-2856 & 2857, 2018 WL 5603576 (2d Cir. Oct. 26, 2018) (same); *In re Dep't of Commerce*, — S. Ct. —, No. 18A455, 2018 WL 5778244 (U.S. Nov. 2, 2018) (same).

resolution of their challenge this Court’s discovery-related orders. (Docket No. 540 (“Defs.’ Motion’)). What makes the motion most puzzling, if not sanctionable, is that they sought *and were denied* virtually the same relief only weeks ago — from this Court, from the Second Circuit, and from the Supreme Court itself. *See In re Dep’t of Commerce*, — S. Ct. —, No. 18A455, 2018 WL 5778244 (U.S. Nov. 2, 2018); *In re U.S. Dep’t of Commerce*, Nos. 18-2856 & 2857, 2018 WL 5603576 (2d Cir. Oct. 26, 2018); *New York v. U.S. Dep’t of Commerce*, No. 18-CV-2921 (JMF), 2018 WL 5307097 (S.D.N.Y. Oct. 26, 2018), *as amended*, 2018 WL 5791968 (Nov. 5, 2018). In fact, if anything, their request is significantly weaker this time around, as the trial is complete and the onus is now on the Court to issue a ruling that facilitates timely and definitive higher-court review. Moreover, Defendants themselves now concede, as they must, that a ruling from this Court will not hinder a higher court from granting full relief on appeal. (*See* Defs.’ Motion 1). Unless burdening Plaintiffs and the federal courts with make-work is a feature of Defendants’ litigation strategy, as opposed to a bug, it is hard to see the point. To borrow from Camus, “[o]ne must imagine Sisyphus happy.” ALBERT CAMUS, THE MYTH OF SISYPHUS 123 (Alfred A. Knopf 1991).

Defendants’ stated reason for burdening Plaintiffs and the Court with the very application that three levels of federal courts only recently denied is the fact that, on November 16, 2018, the Supreme Court granted their petition for a writ of certiorari and set oral argument for February 19, 2019. (Defs.’ Motion 1). But that development is not quite the “significant change in circumstances” that Defendants suggest. (*Id.*). First, as Defendants have previously noted, the Supreme Court’s October 22, 2018 stay of this Court’s Order authorizing a deposition of Secretary Ross had already signaled that the Supreme Court was likely to grant their petition, (Docket No. 397, at 1), and, notably, that stay did *not* disturb either of the two other discovery

orders challenged in the petition, let alone further proceedings in this Court, *see In re Dep’t of Commerce*, — S. Ct. —, No. 18A375, 2018 WL 5259090, at *1 (U.S. Oct. 22, 2018). Second, that “likelihood” was unchanged when the Supreme Court summarily denied Defendants’ request for a stay of further proceedings *before* trial. *In re Dep’t of Commerce*, 2018 WL 5778244. And finally, when it granted certiorari and set a briefing schedule, the Supreme Court knew that this Court had completed trial, and it presumably expected that the Court would enter final judgment before the date that it set for oral argument. That is, the Supreme Court rejected Defendants’ request for immediate relief, in the form of either mandamus or certiorari and reversal without further briefing and oral argument. *See Pet. for Writ of Mandamus* 15, 33, No. 18-557 (U.S. Oct. 29, 2018).

Tellingly, this time, Defendants do not even attempt to argue that they are entitled to the extraordinary relief of a stay of all proceedings under the traditional factors. *See New York*, 2018 WL 4279467, at *1. That is not surprising, as Defendants cannot satisfy any of the four factors, substantially for the reasons set forth in Plaintiffs’ opposition to the motion, filed earlier today. (*See Pls.’ Opp’n* 1-3). Among other things, as the Court stressed last time, the traditional test requires that Defendants show they would suffer “irreparable harm” absent a stay. *See New York*, 2018 WL 5791968, at *2 (quoting *Hollingsworth v. Perry*, 558 U.S. 183, 190 (2010) (per curiam)). Defendants could not make that showing before trial, *see id.* at *2-3, and they certainly cannot make it now. In fact, the words “harm” and “injury” do not appear anywhere in their motion. That is for good reason, as the notion that they — or anyone else — would suffer “irreparable harm” without a stay is laughable. The only “harm” Defendants suffer from denial of a stay is that they would be required to complete and file their post-trial submissions (which are due tomorrow and, presumably, almost done), and to appear for oral argument on November

27, 2018. As the Court has noted before, however, “[m]ere litigation expense, even substantial and unrecoupable cost, does not constitute irreparable injury.”” *Id.* at *2 (quoting *Renegotiation Bd. v. BannerCraft Clothing Co.*, 415 U.S. 1, 24 (1974)).

Since reliance on the traditional test would obviously be unavailing, Defendants try their hand now with a new line of cases, which stand for the uncontroversial proposition that a district court has discretion to stay civil proceedings where doing so would advance the interests of the parties, the courts, and the public. (Defs.’ Motion 2 (citing cases)). But here, for reasons the Court has largely explained before, a stay would undermine, rather than advance, those interests. See *New York*, 2018 WL 5791968, at *6-7. Indeed, by Defendants’ own admission, it will take extraordinary efforts *as it is* to ensure “full merits briefing and argument in the Second Circuit, let alone the Supreme Court, . . . before” the census forms need to be printed in June 2019. (Defs.’ Motion 2).² Such review would become practically impossible if this Court were to await the Supreme Court’s decision after oral argument on February 19, 2019, to get briefing from the parties (on what would, at that point, be a stale record), and then to write and issue a final decision. Compounding matters, that harmful delay would come with no corresponding benefit: As Defendants concede, “the Supreme Court will be able to order effective relief notwithstanding this Court’s entry of a final decision.” (Defs.’ Motion 1). Indeed, a ruling from this Court would aid, not hinder, the Supreme Court’s task — as the Supreme Court may be able to avoid deciding a thorny legal question altogether (if, for instance, the Court enters judgment in

² Notably, Defendants took a different position in seeking to forestall trial. Before the Second Circuit, they argued that delaying trial pending a decision by the Supreme Court on their petition did *not* risk running out the clock, citing the fact that two other courts have scheduled related trials for January 2019. See Mot. to Stay Pretrial and Trial Proceedings 1-2, 9, *In re U.S. Dep’t of Commerce*, No. 18-2856 (2d Cir. Oct. 25, 2018), ECF No. 68.

favor of Defendants or enters judgment in favor of Plaintiffs without relying on evidence outside the administrative record), or would be able to decide that question and the merits together.

Defendants' motion makes so little sense, even on its own terms, that it is hard to understand as anything but an attempt to avoid a timely decision on the merits altogether. That conclusion is reinforced by the fact that Defendants, once again, appealed to the Second Circuit even before this Court had heard from Plaintiffs, let alone issued this ruling on the motion. *See Mot. to Stay District Court Proceedings, In re U.S. Dep't of Commerce*, No. 18-2856 (2d Cir. Nov. 19, 2018), ECF No. 79.³ If Defendants' motion in this Court comes close to the sanctionable line, that filing would sure seem to cross it. The Second Circuit has held — in a case that Defendants themselves cite (*see* Defs.' Motion 1) — that the decision to deny a stay is “so firmly within the discretion of the district court” that it “will not be disturbed . . . absent demonstrated prejudice so great that, as a matter of law, it vitiates a defendant’s constitutional rights or otherwise gravely and unnecessarily prejudices the defendant’s ability to defend his or her rights.” *Louis Vuitton Malletier S.A. v. LY USA, Inc.*, 676 F.3d 83, 100 (2d Cir. 2012). “Indeed, so heavy is the defendant’s burden in overcoming a district court’s decision to refrain from entering a stay” that it is almost impossible to find examples “in which a district court’s decision to deny a stay was reversed on appeal.” *Id.* (noting that the defendants had “pointed to only one” such case “and that case was decided more than thirty years ago”).⁴

³ Defendants justified that step by suggesting that this Court had “implicitly den[ied]” their motion. Mot. to Stay District Court Proceedings 1 n.1, *In re U.S. Dep’t of Commerce*, No. 18-2856. The Court did no such thing: It merely entered an order giving Plaintiffs one day to respond to Defendants’ motion. (Docket No. 541). Unsurprisingly, the Court of Appeals did not countenance Defendants’ extraordinary lack of respect for the ordinary incidents of due process and regular procedure. Earlier this afternoon, that Court summarily denied Defendants’ motion as “premature.” Order, *In re U.S. Dep’t of Commerce*, No. 18-2856 (2d Cir. Nov. 20, 2018), ECF No. 84.

⁴ If past is prologue and Defendants seek a stay from the Supreme Court yet again, their

In the final analysis, Defendants' motion is most galling insofar as it is premised on the suggestion that granting a stay would help conserve judicial resources. (*See* Defs.' Motion 2-3).⁵ It is plainly more efficient for this Court to rule expeditiously, while the evidence from trial (the vast majority of which pertains to standing and which Defendants concede may be considered no matter what the Supreme Court decides (Trial Tr. 1421-22)) is fresh. It is also more efficient for this Court to create a comprehensive record that would enable a single round of higher-court review than to tee up a second round of review with almost no time remaining on the clock. And beyond that, if Defendants were truly interested in conserving judicial resources, they could have avoided burdening this Court, the Second Circuit, and the Supreme Court with *twelve* stay applications over the last eleven weeks that, with one narrow exception, have been repeatedly rejected as meritless. *See supra* note 1. Instead, Defendants would have focused their attention on the ultimate issues in this case, where the attention of the parties and the Court now belongs.

burden will be equally high, if not higher: A request that the Supreme Court "exercise its 'supervisory authority' over" a district court's case management decisions, which is what such an application would be, "implicates a standard even more daunting than that applicable to a stay of a judgment subject to the [Supreme Court's] review." *Gray v. Kelly*, 564 U.S. 1301, 1303 (2011) (Roberts, C.J., in chambers); *see also, e.g., Ehrlichman v. Sirica*, 419 U.S. 1310, 1313 (1974) (Burger, C.J., in chambers) (rejecting a stay application and noting that "[t]he resolution of these issues should they arise after [judgment] must await the normal appellate processes").

⁵ A close second is Defendants' suggestion that "a stay would . . . reduc[e] any risk that the Court's consideration of extra-record evidence would affect the analysis of record materials." (Defs.' Motion 2). Putting aside the arguable insult to the Court's intelligence, Defendants themselves do not appear to believe their own suggestion. As they acknowledge, the Court "has already been exposed to the extra-record evidence" during discovery and trial; no Supreme Court decision can undo that. (*Id.*). Moreover, as Defendants also acknowledge (*id.*), "district courts routinely must disregard improper evidence that has been put before them." *See, e.g., Harris v. Rivera*, 454 U.S. 339, 346 (1981) ("In bench trials, judges routinely hear inadmissible evidence that they are presumed to ignore when making decisions.").

Enough is enough. Defendants' latest motion to halt these proceedings is DENIED.

Barring a stay from the Second Circuit or the Supreme Court, Defendants shall file their post-trial briefing by the Court-ordered deadline of tomorrow and appear for oral argument as directed on November 27, 2018. The Clerk of Court is directed to terminate Docket No. 540.

SO ORDERED.

Dated: November 20, 2018
New York, New York



JESSE M. FURMAN
United States District Judge

S.D.N.Y.-N.Y.C.
18-cv-2921
18-cv-5025
Furman, J.

United States Court of Appeals
FOR THE
SECOND CIRCUIT

At a stated term of the United States Court of Appeals for the Second Circuit,
held at the Thurgood Marshall United States Courthouse, 40 Foley Square, in the
City of New York, on the 21st day of November, two thousand eighteen.

Present:

John M. Walker, Jr.,
Raymond J. Lohier, Jr.,
Circuit Judges,
William H. Pauley III,*
District Judge.

In Re: United States Department of Commerce, Wilbur L. Ross,
in his official capacity as Secretary of Commerce, United States
Census Bureau, an agency within the United States Department
of Commerce, Ron S. Jarmin, in his capacity as the Director of
the U.S. Census Bureau,

18-2856
18-2857

Movants.

The Government moved for a stay of proceedings in two consolidated district court cases pending the Supreme Court's resolution of *In re Department of Commerce*, No. 18-557. We previously denied the motions as premature because the District Court had yet to decide the stay motion pending before it, and we stated that the motion would be automatically reinstated should the District Court deny the motion. See No. 18-2856, Dkt. No. 84. The District Court has now denied the Government's motion. Upon due consideration, and substantially for the reasons set forth in the District Court's brief opinion denying the motion before it, it is hereby ORDERED that the motions for a stay before this Court are DENIED. See *New York v. United States Dep't of Commerce*, No. 18-CV-2921 (JMF), Dkt. No. 544 (S.D.N.Y. Nov. 20, 2018); *Hollingsworth v. Perry*, 558 U.S. 183, 190 (2010). The Government's motion for an immediate administrative

* Judge William H. Pauley III, of the United States District Court for the Southern District of New York, sitting by designation.

stay pending the resolution of its motion to stay proceedings is DENIED as moot.

FOR THE COURT:

Catherine O'Hagan Wolfe, Clerk of Court

 Catherine O'Hagan Wolfe



Exhibit 4

Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14



Scientific Investigations Report 2018–5131

Cover. South Pass; Oregon, Mormon Pioneer, California, and Pony Express National Historic Trails Corridor; Wyoming. Photograph by Bob Wick, Bureau of Land Management, September 16, 2010.

Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14

By Matthew D. Merrill, Benjamin M. Sleeter, Philip A. Freeman, Jinxun Liu,
Peter D. Warwick, and Bradley C. Reed

Scientific Investigations Report 2018–5131

**U.S. Department of the Interior
U.S. Geological Survey**

U.S. Department of the Interior
RYAN K. ZINKE, Secretary

U.S. Geological Survey
James F. Reilly II, Director

U.S. Geological Survey, Reston, Virginia: 2018

For more information on the USGS—the Federal source for science about the Earth, its natural and living resources, natural hazards, and the environment—visit <https://www.usgs.gov> or call 1-888-ASK-USGS (1-888-275-8747).

For an overview of USGS information products, including maps, imagery, and publications, visit <https://store.usgs.gov>.

Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Although this information product, for the most part, is in the public domain, it also may contain copyrighted materials as noted in the text. Permission to reproduce copyrighted items must be secured from the copyright owner.

Suggested citation:

Merrill, M.D., Sleeter, B.M., Freeman, P.A., Liu, J., Warwick, P.D., and Reed, B.C., 2018, Federal lands greenhouse gas emissions and sequestration in the United States—Estimates for 2005–14: U.S. Geological Survey Scientific Investigations Report 2018–5131, 31 p., <https://doi.org/10.3133/sir20185131>.

Acknowledgments

The estimates of fossil fuel-associated emissions in this report were generated by methods that relied heavily on the work of others. Data repositories used and sources of guidance on the methodology are extensively cited in the text. Specific acknowledgements are necessary for contributors who aided the authors in the interpretation of published materials and provided instruction on making the estimates included here. The authors thank the following colleagues in the U.S. Department of the Interior: John Hovanec, Robert Kronebusch, and the Data Services team of the Office of Natural Resources Revenue; Holli Ensz of the Bureau of Ocean Energy Management; and the Bureau of Land Management. The authors also recognize Vincent Camobreco, Mausami Desai, Cate Hight, Christopher Sherry, and Melissa Weitz of the U.S. Environmental Protection Agency (EPA) for assistance in utilizing their methodology, accessing data, and reviewing the manuscript. Thanks are also extended to Allan Kolker of the U.S. Geological Survey (USGS) for a helpful review.

The estimates of carbon sequestration in terrestrial ecosystems were derived primarily through an analysis of modeling projects led by Zhiliang Zhu of the USGS. Specifically, we acknowledge Dave McGuire of the USGS and Hélène Genet of the University of Alaska Fairbanks for their work on modeling carbon fluxes in Alaska and Paul Selmants and Jason Sherba of the USGS and Christian Giardina of the U.S. Forest Service for their work in Hawaii. Furthermore, we thank Paul Selmants of the USGS and Tom Wirth of the EPA for their reviews.

The project's initial stages benefited greatly from the work of Robin O'Malley of the USGS, who organized numerous interagency meetings that lead to valuable data exchange and expertise assistance.

Contents

Acknowledgments.....	iii
Abstract.....	1
Introduction.....	1
Fossil Fuel-Associated Emissions of Greenhouse Gases from Federal Lands.....	3
Introduction.....	3
Data Sources.....	3
Methodology.....	4
Introduction.....	4
Stationary Combustion Emissions.....	5
Mobile Combustion Emissions.....	5
Petroleum and Natural Gas Systems Emissions	5
Active Coal Mine Emissions.....	5
Abandoned Coal Mine Emissions	5
Exported Fuels Emissions.....	6
Results	6
Uncertainty of Emissions Estimates	8
Precision and Rounding of Emissions Estimates.....	8
Terrestrial Ecosystems-Associated Carbon Emissions and Sequestration on Federal Lands.....	10
Introduction.....	10
Data Sources.....	10
Methodology.....	10
Conterminous United States	11
Alaska	12
Hawaii.....	12
Results	12
Net Emissions and Sequestration Results.....	17
Conclusions.....	19
References Cited.....	19
Glossary.....	22
Appendix 1. Detailed Methods: Fossil Fuel-Associated Emissions of Greenhouse Gases from Federal Lands	24
Appendix 2. Detailed Methods: Terrestrial Ecosystems-Associated Carbon Emissions and Sequestration on Federal Lands	30

Figures

1. Map showing the onshore Federal lands (excluding American Indian and Tribal lands) and offshore Federal Outer Continental Shelf planning areas (offshore Pacific and offshore Gulf) included in the emissions and sequestration estimates	2
2. Pie chart showing carbon dioxide emissions associated with the extraction and combustion of fossil fuels produced from Federal lands in the 10 States or offshore regions with the highest emissions, 2014	9
3. Pie chart showing methane emissions associated with the extraction and combustion of fossil fuels produced from Federal lands in the 10 States or offshore regions with the highest emissions, 2014	9
4. Graph showing estimates of annual rates of net primary productivity, net ecosystems productivity, and net biome productivity for the conterminous United States, 1985–2015.....	16

Tables

1. National totals and subtotals for several categories of greenhouse gas emissions associated with the combustion and extraction of fossil fuels from U.S. Federal lands in 2014.....	7
2. National totals for greenhouse gas emissions associated with the combustion and extraction of fossil fuels from U.S. Federal lands in 2005–14	8
3. Explanation of carbon stock and flux terms from the terrestrial ecosystem sequestration calculations.....	11
4. Carbon stocks and fluxes for Federal lands in the conterminous United States, 2005–14.....	13
5. Average annual carbon stocks and fluxes for onshore Federal lands in the United States, 2005–14.....	14
6. Net emissions for Federal lands in the United States, 2005–14	17
1–1. Inputs and sources for the stationary combustion greenhouse gas emissions estimate	25
1–2. Inputs and sources for the mobile sector combustion greenhouse gas emissions estimate	25
1–3. Inputs and sources for the petroleum and natural gas systems greenhouse gas emissions estimate	27
1–4. Inputs and sources for the active coal mining greenhouse gas emissions estimate	27
1–5. Inputs and sources for the abandoned coal mine greenhouse gas emissions estimate	27
1–6. Inputs and sources for the exported fuels greenhouse gas emissions estimate.....	28

Conversion Factors

Multiply	By	To obtain
Length		
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
Area		
square meter (m^2)	10.76	square foot (ft^2)
hectare (ha)	2.471	acre
Volume		
barrel (bbl; petroleum, 1 barrel=42 gallons)	0.1590	cubic meter (m^3)
Mass		
kilogram (kg)	2.205	pound avoirdupois (lb)
metric ton (t)	1.102	ton, short (2,000 lb)
metric ton (t)	0.9842	ton, long (2,240 lb)
Carbon density		
kilogram per square meter (kg/m^2)	0.2048	pound per square foot (lb/ft^2)

Abbreviations

BLM	Bureau of Land Management
CH ₄	methane
CO ₂	carbon dioxide
CONUS	conterminous United States
DOM	dead organic matter
DOS-TEM	Dynamic Organic Soil version of the Terrestrial Ecosystem Model
EIA	U.S. Energy Information Administration
EPA	U.S. Environmental Protection Agency
GPP	gross primary productivity
IBIS	Integrated Biosphere Simulator
km	kilometer
LUCAS	Land Use and Carbon Scenario Simulator
LULC	land use and land cover
m	meter
t CO ₂ Eq./ha	metric tons of carbon dioxide equivalent per hectare
t CO ₂ Eq./ha/yr	metric tons of carbon dioxide equivalent per hectare per year
MMT CO ₂ Eq.	million metric tons of carbon dioxide equivalent
MMT CO ₂ Eq./yr	million metric tons of carbon dioxide equivalent per year
MSHA	Mine Safety and Health Administration
N ₂ O	nitrous oxide
NBP	net biome productivity
NEP	net ecosystems productivity
NPP	net primary productivity
OCS	Outer Continental Shelf
ONRR	Office of Natural Resources Revenue
PADUS	Protected Areas Database of the United States
Ra	autotrophic respiration
Rh	heterotrophic respiration
TEC	total ecosystem carbon
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey

Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14

By Matthew D. Merrill, Benjamin M. Sleeter, Philip A. Freeman, Jinxun Liu, Peter D. Warwick, and Bradley C. Reed

Abstract

In January 2016, the Secretary of the U.S. Department of the Interior tasked the U.S. Geological Survey (USGS) with producing a publicly available and annually updated database of estimated greenhouse gas emissions associated with the extraction and use (predominantly some form of combustion) of fossil fuels from Federal lands. In response, the USGS has produced estimates of the greenhouse gas emissions resulting from the extraction and end-use combustion of fossil fuels produced on Federal lands in the United States, as well as estimates of ecosystem carbon emissions and sequestration on those lands. American Indian and Tribal lands were not included in this analysis. The emissions estimates span a 10-year period (2005–14) and are reported for 28 States and two offshore areas. Nationwide emissions from fossil fuels produced on Federal lands in 2014 were 1,279.0 million metric tons of carbon dioxide equivalent (MMT CO₂ Eq.) for carbon dioxide (CO₂), 47.6 MMT CO₂ Eq. for methane (CH₄), and 5.5 MMT CO₂ Eq. for nitrous oxide (N₂O). Compared to 2005, the 2014 totals represent decreases in emissions for all three greenhouse gases (decreases of 6.1 percent for CO₂, 10.5 percent for CH₄, and 20.3 percent for N₂O). Emissions from fossil fuels produced on Federal lands represent, on average, 23.7 percent of national emissions for CO₂, 7.3 percent for CH₄, and 1.5 percent for N₂O over the 10 years included in this estimate.

In 2005, Federal lands of the conterminous United States stored 82,289 MMT CO₂ Eq. in terrestrial ecosystems. By 2014, carbon storage, or sequestration, was estimated at 83,600 MMT CO₂ Eq., representing an increase of 1.6 percent, or 1,311 MMT CO₂ Eq. Soils stored most of the ecosystem carbon (63 percent), followed by live vegetation (26 percent) and dead organic matter (11 percent). The rate of net carbon uptake in ecosystems ranged from a sink (sequestration) of 475 million metric tons of carbon dioxide equivalent per year (MMT CO₂ Eq./yr) to a source (emission) of 51 MMT CO₂ Eq./yr because of annual variability in climate and weather, rates of land-use and land-cover change, and wildfire frequency, among other factors. At the national level, the USGS estimates that terrestrial ecosystems (forests, grasslands,

and shrublands) on Federal lands sequestered an average of 195 MMT CO₂ Eq./yr between 2005 and 2014, offsetting approximately 15 percent of the CO₂ emissions resulting from the extraction of fossil fuels on Federal lands and their end-use combustion.

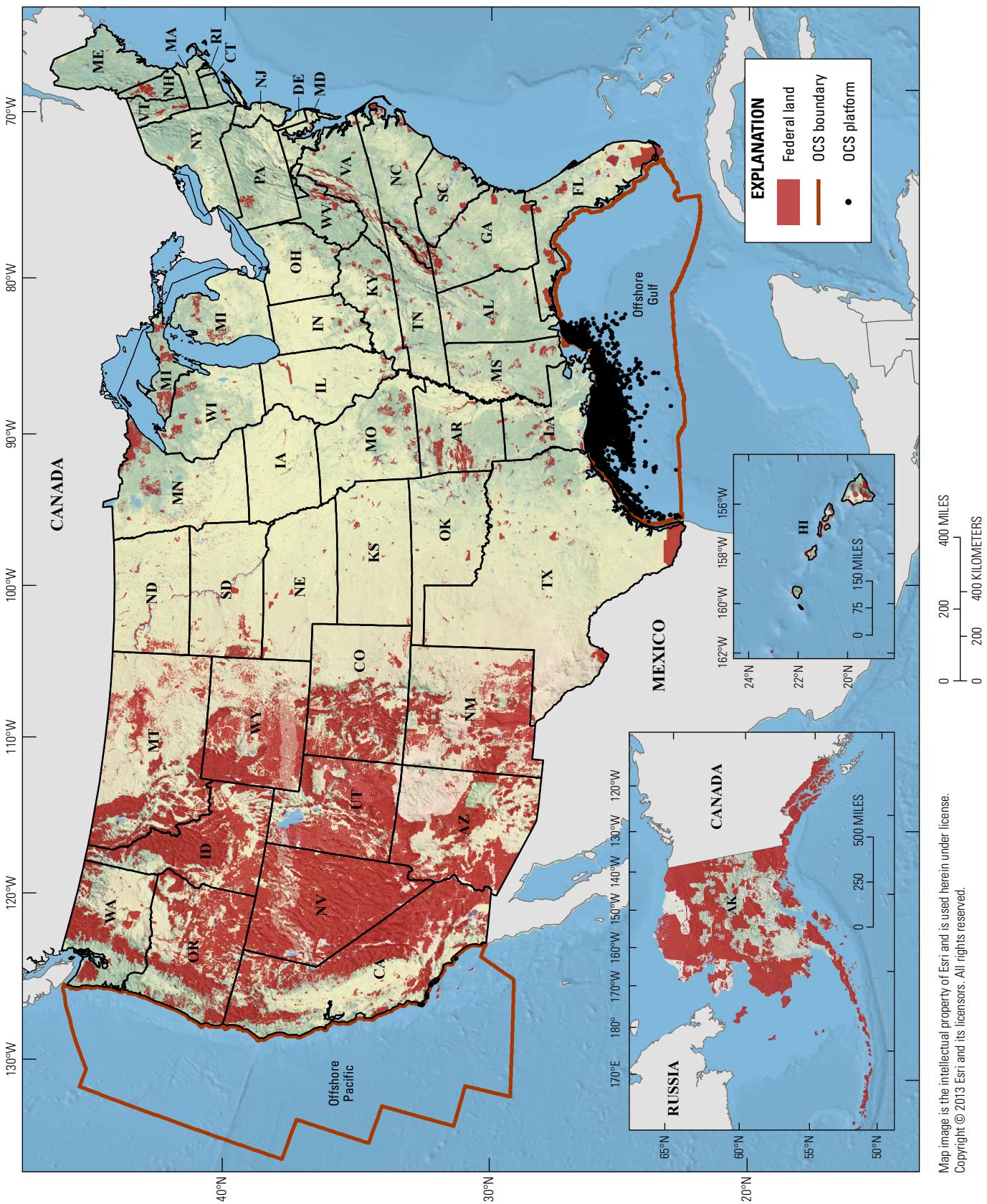
The USGS estimates presented in this report represent a first-of-its-kind accounting for the emissions resulting from fossil fuel extraction on Federal lands and the end-use combustion of those fuels, as well as for the sequestration of carbon in terrestrial ecosystems on Federal lands. The net CO₂ emissions estimate, which is the difference between the emitted and sequestered CO₂, provides an informative combined result describing the emissions (fossil fuel extraction and end-use combustion) associated with a State's Federal lands and sequestration on those same lands. The estimates included in this report can provide context for future energy decisions, as well as a basis to track change in the future.

Introduction

In January 2016, the Secretary of the U.S. Department of the Interior tasked the U.S. Geological Survey (USGS) with producing a publicly available and annually updated database of estimated greenhouse gas emissions associated with the extraction and use (predominantly some form of combustion) of fossil fuels from Federal lands (fig. 1). In response, the USGS began a study of greenhouse gas emissions and carbon sequestration on Federal lands in the United States; the study produced the requested estimates for 2005–14. National estimates of greenhouse gas emissions are published by the U.S. Environmental Protection Agency (EPA), but these estimates do not report emissions from Federal lands specifically. Therefore, this USGS effort relies heavily on the established methods used by the EPA but uses State-level data specific to emissions associated with Federal lands.

Fossil fuel extraction and combustion emit greenhouse gases. Industrial injection of greenhouse gases into the subsurface for enhanced hydrocarbon production or for greenhouse gas storage are forms of sequestration. Industrial sequestration is not included in the estimate because of the small magnitude

2 Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14



Map image is the intellectual property of Esri and is used herein under license.
Copyright © 2013 Esri and its licensors. All rights reserved.

of current industrial sequestration and a paucity of available data. Ecosystems can also sequester or emit greenhouse gases. Therefore, the estimated fossil fuel-associated emissions are supplemented with the estimated net flux of carbon associated with plants and other organisms (ecosystems) on Federal lands. The inclusion of ecosystem estimates provides the opportunity to calculate a net emission result (for carbon dioxide [CO_2] only) by comparing the fossil fuel-associated emissions estimates with those for carbon stored or released from ecosystems on Federal lands. For clarity and brevity, in this report, the term “emissions” generally, but not exclusively, refers to fossil fuel-associated emissions and the term “sequestration” commonly refers to sequestration in terrestrial ecosystems. However, both industrial fossil fuel activities and ecosystems emit and sequester greenhouse gases. For ease of comparison between fossil fuel-associated emissions and ecosystems flux estimates, the values in this report are presented in equivalent amounts of CO_2 gas.

The discussion of the estimates is separated into two sections: “Fossil Fuel-Associated Emissions of Greenhouse Gases from Federal Lands” and “Terrestrial Ecosystems-Associated Carbon Emissions and Sequestration on Federal Lands.” The first covers emissions of CO_2 , methane (CH_4), and nitrous oxide (N_2O) from the extraction and eventual end-use combustion of fossil fuels produced on Federal lands, and the second deals with the sequestration and emission of carbon in terrestrial ecosystems on Federal lands. Both sections detail the data sources, methodology, and results specific to the estimates. The report concludes with a discussion of the net emissions attributed to Federal lands; these are the estimates produced by summing the emissions and sequestration results. Appendixes 1 and 2 supply additional information regarding the data sources and methodology.

Figure 1 (facing page). Map showing the onshore Federal lands (excluding American Indian and Tribal lands) and offshore Federal Outer Continental Shelf (OCS) planning areas (offshore Pacific and offshore Gulf) included in the emissions and sequestration estimates. The Federal Atlantic and Alaska OCS planning areas were excluded because they did not have fossil fuel production during the study period. Federal lands were modified from the U.S. Geological Survey Protected Areas Database of the United States (U.S. Geological Survey, 2016). OCS boundaries and platforms are from Minerals Management Service (2006a, b), Bureau of Ocean Energy Management (2011), and Bureau of Safety and Environmental Enforcement (2014).

Fossil Fuel-Associated Emissions of Greenhouse Gases from Federal Lands

Introduction

For the emissions portion of this study, we estimated the greenhouse gas emissions (CO_2 , CH_4 , and N_2O) resulting from the extraction and end-use combustion of fossil fuels derived from U.S. Federal lands, including offshore areas. The Gulf of Mexico Outer Continental Shelf (OCS) and Pacific OCS planning areas are included in this report and referred to as offshore Gulf and offshore Pacific, respectively. No other OCS areas are included in this report because they did not produce fossil fuels during the period of this study. Emissions are produced through two processes: (1) the combustion of fuel for electricity generation, mechanical work, heating, or use as a feedstock and (2) the fugitive emission of gases during the processes of extracting and moving fuel. Fugitive emissions were attributed to the areas where the fuels originated; the location of the eventual combustion of the fuel, whether on Federal, State, private, or international territory, was not a factor. If the fuel was sourced on Federal lands, it was included in the estimate regardless of where it was used. All references to emissions in this section are associated with fossil fuels extracted from Federal lands in States and offshore areas. American Indian and Tribal lands were not included in this analysis.

Data Sources

Four main types of data support the emissions estimates in this report: (1) Federal lands fuel (oil, gas, and coal) production; (2) emissions from coal mines and oil and gas infrastructure (fugitive emissions); (3) national- and State-level energy-consumption and emissions data for apportioning extracted fuel to end-use fuel type and economic sector; and (4) process-specific emission factors that determine the volumes of greenhouse gases emitted by combusted fuels. A general discussion of the data sources is provided here, and an in-depth listing of data sources is provided in appendix 1.

Data on Federal lands fuel production are collected as part of royalty tracking by the Office of Natural Resources Revenue (ONRR) in the U.S. Department of the Interior. The ONRR is the Federal data source for revenue generated from fuel production on Federal lands. Production data collected by the ONRR (made available to the USGS via Memorandum of Agreement MOA16-5285) were the main input to the emission estimate calculations. These values include coal, oil, and natural gas production from Federal lands in 28 States and the Federal offshore Pacific and offshore Gulf. No fossil fuels were produced on Federal lands in the remaining 22 States or the Atlantic and Alaska offshore areas during the study period. In addition, the ONRR production data provided to the USGS

4 Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14

could not be attributed to specific Federal land management agencies. Data from the ONRR were available at the level of detail required for this project starting in 2005; data availability was through 2014, the final complete year when this project began.

Fugitive emissions include measured or estimated releases of CH₄ from underground and surface coal mines (both active and abandoned) and CO₂ and CH₄ emissions from oil and gas infrastructure such as wells, pipelines, compressors, and storage tanks. These data were provided by the EPA but collected by the Mine Safety and Health Administration (MSHA). The MSHA measures emissions from some underground coal mines, and mine operators submit other emissions estimates and measurements to the EPA's Greenhouse Gas Reporting Program.

The third set of values required to complete the emissions estimate consists of national- and State-level energy production, sector usage, refining, and export statistics. The source of these statistics is the U.S. Energy Information Administration (EIA), which is part of the U.S. Department of Energy. These published statistics (see references in appendix 1) were used to generate ratios for apportioning the Federal production volumes to end-use fuel types and economic sectors. This allocation was necessary because it is often impossible to track coal, oil, or gas from a specific Federal source as it moves through the fuel supply system to its eventual endpoint where emissions are generated. Fuels from most Federal lands are combined with fuels from private and State lands in pipelines, containers, or shipments, and once combined, the origins of the fuels are no longer traceable. In 2014, approximately 42 percent of the total crude oil produced in the United States was refined into motor gasoline (U.S. Energy Information Administration, 2015c). We assumed that this ratio also holds for crude oil from Federal lands, such that if a State produced 1 million barrels of oil from Federal lands, it would be assumed that 42 percent of the 1 million barrels was refined into motor gasoline. Though the actual number is certainly different, it is not possible with the currently available data to determine the amount of motor gasoline produced from a State's Federal-lands crude oil. Ratio-based scaling from national- or State-level production volumes was used throughout the estimate calculation for amounts of products refined from crude oil, industrial uses of natural gas, sector usage for coal combustion, and international fuel exports. The specific EIA sector usage, refining, and State export reports used in this calculation are listed in appendix 1.

Emission factors are the values used to convert volumes of fuel combusted into amounts of greenhouse gases emitted. These conversions differ by the input fuel and the sector of the economy where that fuel is consumed. The EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks (hereafter EPA Inventory; U.S. Environmental Protection Agency, 2016b), an annual publication of total U.S. greenhouse gas emissions, is the source of all emission factors used in this study. In addition, the EPA Inventory's calculation methodology is the basis for the methods used in this study.

Methodology

Introduction

The methods used in this study to estimate greenhouse gas emissions from fossil fuel produced on Federal lands are adapted from the more exhaustive methodology described in the EPA Inventory and its associated annexes (U.S. Environmental Protection Agency, 2016a, b). The EPA Inventory follows the guidelines set by the United Nations Framework Convention on Climate Change to produce a common and consistent mechanism for estimating sources and sinks of anthropogenic greenhouse gases that will allow for relative comparisons of different emissions sources (U.S. Environmental Protection Agency, 2016b). The United States signed and ratified the United Nations Framework Convention on Climate Change in 1992, and the EPA has produced its Inventory since 1997. The EPA methodology is consistent with that recommended in the Intergovernmental Panel on Climate Change's "2006 IPCC Guidelines for National Greenhouse Gas Inventories" (Intergovernmental Panel on Climate Change, 2006).

The USGS estimation method differs from the EPA method in scale, scope, and complexity. Calculation of emissions estimates at the scale of Federal lands and individual States is how the USGS process varies the most from the EPA Inventory's methodology. Fine-scale estimates are generally achieved through a bottom-up calculation method; however, the USGS could not obtain State-level data for some parameters. Unavailable inputs were produced by scaling down national-level data from the EPA and EIA. This process is explained in the following sections and in appendix 1.

In terms of scope, the USGS was tasked with investigating the emissions associated with the extraction of fossil fuels on Federal lands and their end-use combustion. Therefore, the USGS estimate is restricted to only the emissions covered in the "Energy" chapter of the EPA Inventory and does not include emissions from agricultural, industrial, or waste-processing activities. Simply stated, the USGS scope discussed in this report is much narrower than that assigned to the EPA. There is, however, one exception: we included an estimate for the end-use combustion emissions of fossil fuels that were produced on Federal lands and exported internationally. As explained in the "Exported Fuels Emissions" section, the emissions from these products are not included in the EPA Inventory.

Emissions estimates provided in the EPA Inventory are the official estimates for the United States and, as such, are produced with annual reviews and refinements by a team of researchers. This USGS study does not strive to improve the EPA's methodology but instead to utilize it. In summary, this USGS estimate borrows heavily from the portion of the EPA method concerning energy-related emissions and is adapted to produce State-level outputs by using inputs specific to Federal lands. The EPA and USGS methods are not competing methods, and the USGS method is not an improvement on any part of the EPA method.

The following sections highlight the general process used to generate the estimates in this study. Because the EPA Inventory served as the main guiding document, this report cites those methods rather than restating them. Introductory information, differences in methods, and process steps that require additional clarification are discussed in the following sections. For specific process steps and tables of data sources, refer to appendix 1.

Stationary Combustion Emissions

Stationary emissions encompass greenhouse gas emissions from the combustion of fossil fuels in nonmobile (non-transportation) sectors. These sectors include the combustion of coal for electricity generation, commercial use, industrial use, and coking coal production. Burning natural gas for electricity generation and the use of natural gas as a feedstock in industrial processes are also included. Refining crude oil to produce liquid fuels used to generate heat or electricity also represents stationary emissions. Various emission factors were used to convert the amounts of fuel combusted into estimates of emissions. Currently, emission factors available in the literature are generally fuel or end-use sector specific. Because of their various uses, the emission factors for stationary combustion of liquid fuel are fuel specific. Emission factors for natural gas and coal are based on the sectors of the economy where the fuels are used. For example, stationary coal combustion emission factors are based on the combustion of mixed ranks of coal in specific sectors of the economy, such as electricity generation versus industrial coking, rather than coal rank, such as the amount of bituminous versus lignite coal used. The use of sector-specific versus rank-specific emission factors allowed the methodology to leverage detailed coal datasets that include annual coal consumption by State of origin and end-use sector (but not by rank) for all coal use in the United States. See appendix 1 for a detailed list of data sources for stationary combustion emissions.

Mobile Combustion Emissions

Calculations of mobile emissions are complicated by the changing technology, efficiency, and total mileage of vehicles driven, flown, and piloted in the United States in any given year. Considering this reality, the USGS method leans heavily on the national emissions calculations included in the EPA Inventory and associated annexes (U.S. Environmental Protection Agency, 2016a, b). The national-level data from the EPA were devolved to ratios of greenhouse gas emissions per gallon of fuel. The ratios were then multiplied by the gallons of fuels that were estimated to have been refined from crude oil produced from Federal lands. The USGS estimate therefore provides emissions estimates for only the fuels that the EPA has estimates for. These are the major fuels—motor gasoline, aviation gasoline, jet kerosene, diesel oil, residual fuel oil, and liquefied petroleum gas—and account for nearly all mobile emissions.

Petroleum and Natural Gas Systems Emissions

This section covers calculations for greenhouse gases released during the extraction and transportation (for example, through pipelines) of natural gas and oil on Federal land, as well as platforms in Federal offshore areas. These types of emissions are generally referred to as fugitive emissions. All fugitive emissions estimates made by the USGS follow a methodology similar to that used for mobile emissions. Because of the complexity involved in determining the emissions from natural gas and oil infrastructure, the USGS relied on the established work of the EPA Inventory rather than attempting to generate the emissions values separately. A ratio of emissions per well, including fugitive emissions from production through distribution for gas and from production through refining for oil, was generated from the EPA Inventory's national emissions estimates (U.S. Environmental Protection Agency, 2016b). This ratio was multiplied by the number of wells producing oil and gas from Federal lands (Bureau of Land Management, written commun., 2016) to estimate the emissions associated with oil and gas infrastructure on those lands. For offshore platforms, the EPA has produced per platform emissions rates that are based on the depth and type of hydrocarbon produced. These rates were used to determine the emissions associated with platforms producing in the Federal offshore Pacific and offshore Gulf areas (U.S. Environmental Protection Agency, 2015).

Active Coal Mine Emissions

Emissions from active coal mines were estimated only for CH₄ at underground and surface mines by using methods outlined in annex 3.4 of the EPA Inventory (U.S. Environmental Protection Agency, 2016a). CH₄ gas is released both during mining and after mining as coal is degassed while in transport and processing. Data for active underground coal mine emissions are collected by the MSHA and reported by mine operators to the EPA Greenhouse Gas Reporting Program. Postmining emissions from underground mines are based on the amount of coal produced from the mine, as well as a basin-specific coal CH₄ content factor. Active surface mine emissions were calculated in a way similar to the postmining emissions from underground coal mines. Postmining emissions from surface mines are based on data collected by the MSHA or reported by mine operators, similar to emissions from active underground mines.

Abandoned Coal Mine Emissions

Even after an underground mine has stopped actively producing coal, the remaining coal releases CH₄ gas for some time. An abandoned mine can be sealed, vented, or flooded as groundwater permeates the mine. The method of abandonment will affect the amount and rate of CH₄ released. In general, mines will release the most CH₄ immediately after abandonment, and the rate will decrease over time. The

6 Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14

rate of decline and the effects of the geology and method of abandonment are explained in the EPA's methodology for estimating abandoned mine emissions (Franklin and others, 2004; U.S. Environmental Protection Agency, 2004). We used a slightly simplified nonprobabilistic version of the method used by the EPA. See appendix 1 for more details on the calculation.

Exported Fuels Emissions

End-use emissions associated with fossil fuels exported from the United States are not included in the EPA Inventory. The Intergovernmental Panel on Climate Change's "2006 IPCC Guidelines for National Greenhouse Gas Inventories" (Intergovernmental Panel on Climate Change, 2006) specified that emissions are counted in the nation where they were emitted; therefore, the EPA includes combustion emissions from imported fuel but not exported fuel. The USGS estimate includes a separate output for emissions from the combustion of fuels produced on Federal lands and exported. However, it is important to note that oil or gas from specific wells or even fields cannot be traced through the U.S. energy system. Coal from some mines may be traceable because of the method of transportation, but those data are not available to the USGS. Therefore, exported fuel amounts were estimated on the basis of national (oil and gas) or State (coal) export data provided by the EIA (U.S. Energy Information Administration, 2015b, 2016a, 2016b). Exported oil, gas, and coal volumes were separated from the gross State production in each of the methods described above. The export volumes were then separately run through the same calculation as the domestic fuel volumes. Essentially, the USGS method calculated a small subset of international emissions. To do this, we assumed that the emission factors in the United States are the same as those in the countries that imported the fuels. Domestic sector proportions specific to each State (if available) and year were the same as those used for the export estimates. These generalized assumptions were necessary because separating the exports by the nations that imported them, determining sector usage proportions for each nation, and using emission factors specific to those nations would amount to an unwarranted level of effort to expend on already estimated export volumes.

Results

The USGS estimates of emissions from the combustion of fossil fuels produced on Federal lands include output values for CO₂, CH₄, and N₂O gases in 28 States, offshore Pacific, and offshore Gulf for the years 2005 through 2014. The results are further segmented by emission category, the sector of the economy, and often, the specific fuel used. Emission categories include stationary combustion, mobile combustion, active coal mining, and others. Examples of sectors include coal used for electricity generation, coal used for industrial applications, diesel oil, natural gas infrastructure, and offgassing from

active mines. Because of data availability and method limitations, emissions for each of the three gases were not estimated for all categories, sectors, and fuels. The total numbers of output estimates generated by gas type are 15 for CO₂, 13 for CH₄, and 9 for N₂O. Table 1 contains the USGS emissions estimates for Federal lands in 2014. All results are reported in million metric tons of CO₂ equivalent (MMT CO₂ Eq.). The conversion to CO₂ equivalents enables direct comparison of the different gases. To make the conversion, the amounts of gases are multiplied by their global warming potential, a factor that accounts for the effect a specific gas has in warming the atmosphere relative to the effect of CO₂; the values for the three gases are 1 for CO₂, 25 for CH₄, and 298 for N₂O (Intergovernmental Panel on Climate Change, 2007).

The emissions estimates generated during this study span a 10-year period from 2005 to 2014 and pertain to 30 geographic areas and 37 sector- or fuel-specific outputs. Therefore, the figures and tables presented in this report only summarize the results and are not intended to be a complete presentation of all results. The full dataset is available online at <https://doi.org/10.5066/F7KH0MK4> (Merrill and others, 2018). An interactive map is available at <https://eerscmap.usgs.gov/fedghg>.

Nationwide emissions from fuels extracted from Federal lands in 2014 were 1,279.0 MMT CO₂ Eq. for CO₂, 47.6 MMT CO₂ Eq. for CH₄, and 5.5 MMT CO₂ Eq. for N₂O. The 2014 totals represent decreases in emissions for all three greenhouse gases compared to 2005 values, with reductions of 6.1 percent for CO₂, 10.5 percent for CH₄, and 20.3 percent for N₂O. Total emissions from the production and combustion of fossil fuels produced on Federal lands for the years 2005–14, as well as comparisons to total U.S. emissions, are presented in table 2. On average, Federal lands fuels emissions from 2005 to 2014 accounted for 23.7 percent of national CO₂ emissions, 7.3 percent for CH₄, and 1.5 percent for N₂O (table 2).

In 2014, Wyoming, offshore Gulf, New Mexico, Louisiana, and Colorado had the highest CO₂ emissions from fuels produced on Federal lands (fig. 2). The CO₂ emissions attributed to Federal lands in Wyoming are 57 percent of the total from Federal lands in all States and offshore areas combined. Emissions estimates for the release of CH₄ are also highest for Federal lands in Wyoming (28 percent), followed by New Mexico, offshore Gulf, Colorado, and Utah (fig. 3).

Unsurprisingly, the trends and relative magnitudes of the emissions estimated are roughly parallel to the Federal lands production volumes (U.S. Energy Information Administration, 2015a). States that produced the most fuel from Federal lands are associated with the highest emissions for CO₂, CH₄, and N₂O. These relationships vary slightly relative to absolute production because different fuels require different extraction methods and fuel uses emit varying amounts of greenhouse gases. Trends in emissions over the 10 years of the estimate could indicate changes in production volumes; however, in States where multiple fuels were produced, these relationships may not be evident or direct. Although emission factors, numbers of producing wells, vehicle efficiency, and sector

Fossil Fuel-Associated Emissions of Greenhouse Gases from Federal Lands 7

Table 1. National totals and subtotals for several categories of greenhouse gas emissions associated with the combustion and extraction of fossil fuels from U.S. Federal lands in 2014.

[The full dataset associated with this study (Merrill and others, 2018) contains similar data for 28 States and two offshore areas for 2005–14. For the sector subtotals, the number of significant figures indicates the precision in the underlying State-level estimates. The emissions category totals and Federal lands emissions totals are national totals summed from individual estimates and not the subtotals presented in this table. Therefore, the subtotals listed here may not sum to the national totals. All national totals are reported to one decimal place if greater than 1.0 million metric tons of carbon dioxide equivalent (MMT CO₂ Eq.) or to two significant figures if less than 1.0 MMT CO₂ Eq. CO₂, carbon dioxide; CH₄, methane; N₂O, nitrous oxide; —, values not calculated]

Sector/fuel	CO₂ emissions (MMT CO₂ Eq.)	CH₄ emissions (MMT CO₂ Eq.)	N₂O emissions (MMT CO₂ Eq.)
Combustion emissions from stationary sources			
Coal: electricity generation	725.36	2.09	3.68
Coal: industrial	9.3	0.0268	0.047
Coal: industrial coking	0.016	0.00005	0.00009
Coal: commercial	0.21	0.0006	0.001
Petroleum products	41.77	0.039	0.095
Natural gas	217	0.10	0.12
Stationary total	993.6	2.3	3.9
Combustion emissions from mobile sources			
Motor gasoline	110.892	0.143	1.239
Aviation gasoline	0.3	—	—
Jet kerosene	25.58	—	—
Diesel oil	58.25	—	0.06
Residual fuel oil	4.61	—	—
Liquefied petroleum gas	0.078	—	—
Mobile total	199.7	0.14	1.3
Extraction emissions from petroleum and natural gas systems			
Petroleum wells, equipment, and platforms	0.18	7.97	—
Natural gas wells, equipment, and platforms	5.3	25.31	—
Extraction emissions from coal mining			
Surface mines	—	4.34	—
Underground mines	—	6.20	—
Abandoned mines	—	1.22	—
Coal mining total	—	11.8	—
Total emissions from Federal lands			
Domestic	1,198.8	47.5	5.2
Exported	80.2	0.10	0.27
Total Federal lands	1,279.0	47.6	5.5

8 Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14

Table 2. National totals for greenhouse gas emissions associated with the combustion and extraction of fossil fuels from U.S. Federal lands in 2005–14.

[CO₂, carbon dioxide; CH₄, methane; NO_x, nitrous oxide; MMT CO₂ Eq., million metric tons of carbon dioxide equivalent]

Year	CO ₂ emissions		CH ₄ emissions		N ₂ O emissions	
	Federal lands fossil fuels (MMT CO ₂ Eq.)	Percentage of U.S. total ¹	Federal lands fossil fuels (MMT CO ₂ Eq.)	Percentage of U.S. total ¹	Federal lands fossil fuels (MMT CO ₂ Eq.)	Percentage of U.S. total ¹
2005	1,361.9	22.2	53.2	7.4	6.9	1.7
2006	1,378.6	22.8	53.4	7.4	6.8	1.7
2007	1,398.3	22.8	53.8	7.4	6.4	1.5
2008	1,427.9	24.1	55.8	7.6	6.5	1.6
2009	1,422.5	25.9	53.4	7.3	6.7	1.7
2010	1,429.4	25.1	53.3	7.4	6.6	1.6
2011	1,362.4	24.5	55.7	7.8	6.2	1.5
2012	1,280.5	23.9	52.0	7.3	5.7	1.4
2013	1,210.5	22.0	48.8	6.8	5.4	1.3
2014	1,279.0	23.0	47.6	6.5	5.5	1.4

¹Percentages calculated from total U.S. emissions (U.S. Environmental Protection Agency, 2016b).

usage rates all change from year to year, they have minimal effect on the final emissions results compared to the amount of fossil fuel production. Any significant changes in production will result in a similar change in the attributed emissions. Federal lands fuels production by State (U.S. Energy Information Administration, 2015a) is therefore very similar in relative magnitude to the emissions results presented in this report.

Uncertainty of Emissions Estimates

The emissions estimates in this report do not include estimates of uncertainty. Calculated uncertainties provided in the annexes to the EPA Inventory (U.S. Environmental Protection Agency, 2016a, annex 7) are informative and presumed to be applicable because the USGS employed a slightly modified EPA methodology. In summary, the EPA determined that the emissions estimate uncertainty was smaller for combustion calculations than uncertainties for fugitive emissions from extractive activities. This difference in uncertainties is intuitive because combusted materials are measured for sale and therefore are well constrained, whereas the amounts of gases emitted from extraction are often estimated or scaled up from smaller sampling efforts. For example, the annexes to the EPA Inventory (U.S. Environmental Protection Agency, 2016a, annex 7) cited uncertainty with a 95-percent confidence interval from –2 to 5 percent of the 2014 mean CO₂ emissions from fossil fuel combustion. In contrast, nonenergy CO₂ emissions uncertainties ranged from –25 to 42 percent. Uncertainties for CH₄ emitted by coal mining ranged from –12 to 15 percent. Overall, owing to the significant proportion of emissions tied to the combustion of fossil fuels, the total uncertainty of the EPA Inventory estimate was between –2 and 5 percent.

Precision and Rounding of Emissions Estimates

The emissions estimates summarized in this report and provided in the associated dataset (Merrill and others, 2018) were formatted in an effort to indicate their precision. For all nontotal values, meaning those estimates that represent a single sector, gas, State, and year combination, the number of significant figures indicates the level of precision inherent in the calculations that generated that number. In the calculations used to generate the estimates, accurate but less precise sector ratios or emission factors are commonly the parameters with the least precision, and they limit the estimate's precision.

For the convenience of the reader, this report and the associated dataset include totals for grouped sectors such as stationary combustion, mobile combustion, and coal mine fugitive emissions. Totals for domestic, exported, and overall total emissions are also included. These totals are formatted in a specific way to capture the 12 orders of magnitude in range present in the various estimates of this dataset. Totals greater than or equal to 1.0 MMT CO₂ Eq. are rounded to the first decimal place, whereas values less than 1.0 MMT CO₂ Eq. are shown with two significant figures. This method of representing the estimates, used only for totals, facilitates the comparison of emissions totals that are below 1.0 MMT CO₂ Eq.

Performing calculations on the rounded total values, such as summing State total emissions rather than all individual sector emissions, to obtain national emissions will incur and possibly compound rounding errors. Users of the dataset are advised to perform calculations on the individual values rather than the rounded totals. All totals in this report were calculated from the underlying individual estimate values and are deemed accurate; the totals are not summations of subtotals.

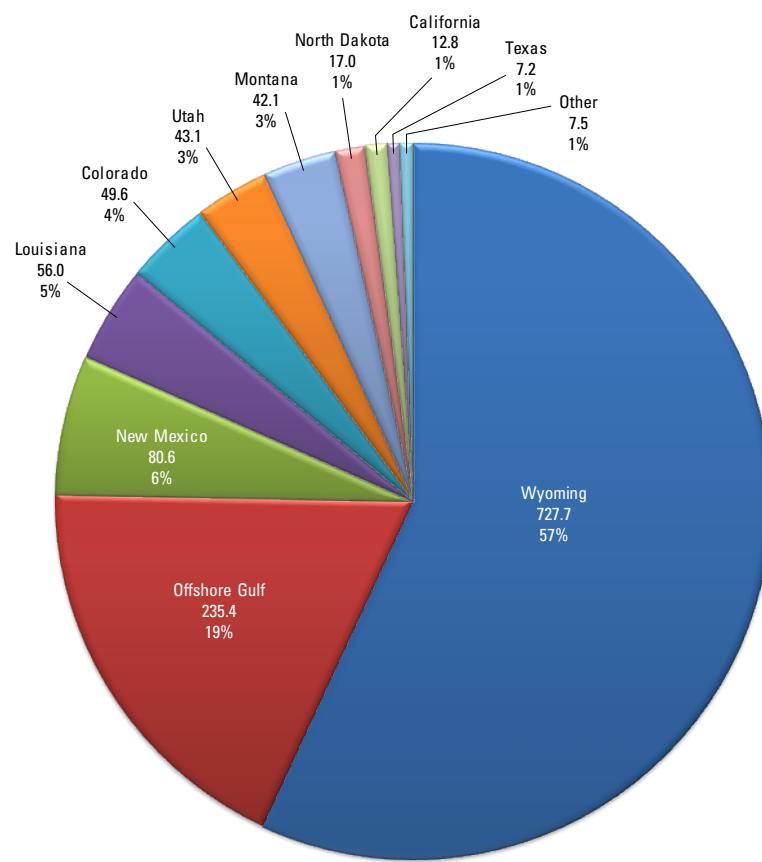
Fossil Fuel-Associated Emissions of Greenhouse Gases from Federal Lands 9

Figure 2. Pie chart showing carbon dioxide emissions associated with the extraction and combustion of fossil fuels produced from Federal lands in the 10 States or offshore regions with the highest emissions, 2014. Emissions are reported in million metric tons of carbon dioxide equivalent (MMT CO₂ Eq.).

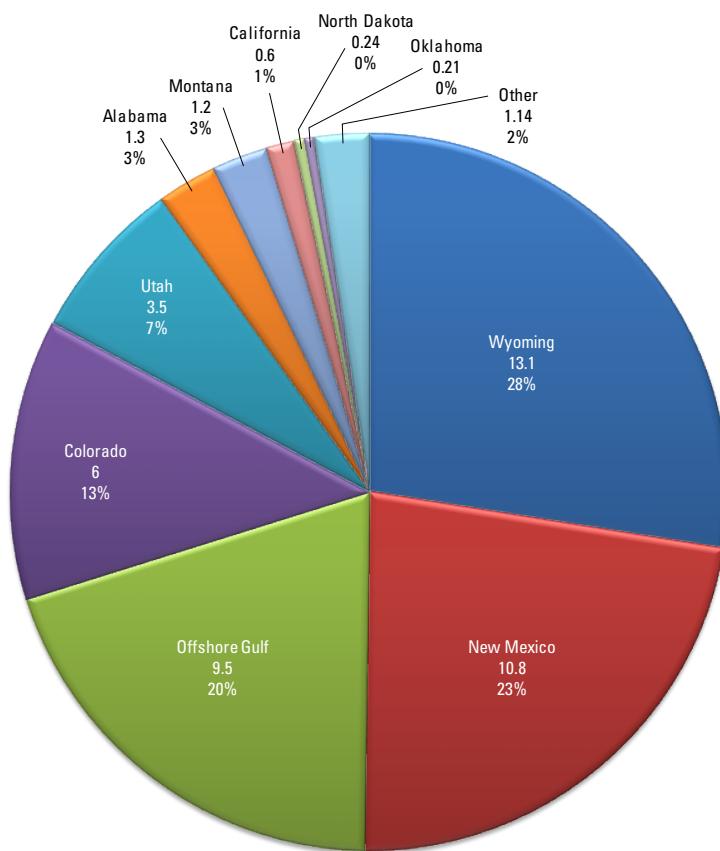


Figure 3. Pie chart showing methane emissions associated with the extraction and combustion of fossil fuels produced from Federal lands in the 10 States or offshore regions with the highest emissions, 2014. Emissions are reported in million metric tons of carbon dioxide equivalent.

Terrestrial Ecosystems-Associated Carbon Emissions and Sequestration on Federal Lands

Introduction

For the ecosystems emissions and sequestration portion of the USGS study, we estimated the annual amount of CO₂ that was stored and emitted by terrestrial ecosystems, including forests, grasslands, shrublands, and agricultural lands. Plants convert CO₂ to carbon through photosynthesis, which is expressed as gross primary productivity (GPP). See table 3 for a summary of the terms introduced in this section. The terms include stocks, the amount of carbon present in a carbon reservoir, and fluxes, annual changes to those stocks that can be additions (sequestration) or removals (emissions). Autotrophic respiration (Ra) is the release of CO₂ back to the atmosphere by plants through respiration. The difference between GPP and Ra is referred to as net primary productivity (NPP), or the amount of CO₂ fixed or stored in new vegetation each year. Ecosystems also respire CO₂ through the decay and decomposition of dead organic matter (DOM), referred to as heterotrophic respiration (Rh). The total net ecosystems productivity (NEP) can thus be estimated as GPP – (Ra + Rh).

Changes to ecosystems, typically caused by wildfires (fire) and forest harvest (harvest), are considered forms of land-use and land-use and land-cover (LULC) change. Other forms of LULC change, including agricultural harvesting, are grouped in a separate category in this study (other). These changes typically result in the removal of carbon from the ecosystem and are therefore considered emissions for the purpose of this study. Ecosystem carbon losses associated with land use and land-use change and disturbance are subtracted from NEP to estimate net biome productivity (NBP), which reflects the absolute change in carbon stored within ecosystems on an annual basis. NBP is an appropriate value for comparison with annual fossil fuel-associated emissions and is used again in this report where the concept of net emissions is introduced. In the full dataset associated with this study (Merrill and others, 2018), we provide estimates of most of the stocks and fluxes in table 3. Estimates are included for carbon stocks such as TEC, Live, DOM, and Soil and annual carbon fluxes such as Rh, NPP, NEP, NBP, fire, harvest, and other for Federal lands of the United States for the period 2005–14.

Data Sources

This USGS study used three main sources to estimate the carbon balance on Federal lands of the United States. For the conterminous United States (CONUS), we analyzed the results of net ecosystem carbon fluxes produced by a dynamic global vegetation model. For the State of Hawaii, we estimated ecosystem carbon balance by using a look-up table approach

based on results from a recent USGS assessment of carbon storage and fluxes (Selmants and others, 2017). The net carbon balance for Alaska was estimated from another recent USGS assessment (Zhu and McGuire, 2016). These three existing sources contain estimates that span different ranges of years, all longer than the span of this study; however, the results from those additional years are not included in this report or the associated dataset because they do not match the study period for the fossil fuel-associated estimates (2005–14). Here we provide an overview of the sources used to estimate the net carbon balance on Federal lands. Additional details are provided in appendix 2.

We estimated carbon balance on Federal lands of the CONUS by analyzing spatially explicit maps of net carbon fluxes produced by using a process-based dynamic global vegetation model (Liu and others, 2016). Carbon stock and flux maps were estimated by using the Integrated Biosphere Simulator (IBIS) model (Foley and others, 1996; Kucharik and others, 2000). The IBIS model was used to estimate changes in carbon stocks and fluxes for the period 1970–2015 at approximately 1-kilometer (km) x 1-km resolution for all forests, grasslands, shrublands, wetlands, and agricultural land areas within the CONUS. Annual maps of carbon stocks and fluxes were combined with maps of Federal lands to produce annual estimates of carbon balance by State for the 45-year period.

Carbon fluxes for the State of Hawaii were derived through an analysis of data produced in support of the USGS biological carbon sequestration assessment for the State (Selmants and others, 2017). The assessment included estimates of carbon stocks and fluxes for forests, grasslands, and shrublands across three moisture zones (dry, mesic, and wet). Average annual carbon stock and flux densities were developed for the current study and applied to the State's Federal land area.

For Alaska, estimates of ecosystem carbon dynamics were based on the USGS biological carbon sequestration assessment for the State (Zhu and McGuire, 2016). The Alaska assessment yielded estimates of carbon stocks and fluxes from uplands and wetlands across a baseline period of 1950–2010. The Alaska assessment produced a set of mean annual carbon stock and flux maps for the period 2001–10 that were used to estimate the average carbon balance of Alaska's Federal lands.

Methodology

Because of differences in existing work, calculation model structure, and data availability, the estimates of ecosystems carbon emissions and sequestration were prepared separately for the CONUS, Alaska, and Hawaii. The CONUS analysis was based on simulations that used the IBIS model (Liu and others, 2016). The Alaska data were modified from existing work by Zhu and McGuire (2016), and the Hawaii results were modified from Selmants and others (2017). The methodologies behind these three estimates are discussed briefly here and with more detail in appendix 2.

Terrestrial Ecosystems-Associated Carbon Emissions and Sequestration on Federal Lands

11

Table 3. Explanation of carbon stock and flux terms from the terrestrial ecosystem sequestration calculations.[Terms are grouped by carbon stock or typical flux type. This table may be useful in viewing the results in tables 4 and 5. CO₂, carbon dioxide]

Term	Name	Explanation
Stocks: terrestrial carbon reservoirs		
TEC	Total ecosystem carbon	Total carbon stored in an ecosystem; the combination of carbon stored in soils, DOM, and live vegetation.
Live	Live vegetation	Carbon stored in live vegetation, both above and below ground.
Soil	Soil organic matter	Carbon stored in the organic material of soils.
DOM	Dead organic matter	Carbon stored in dead organic matter.
Fluxes: carbon sequestration		
GPP	Gross primary productivity	CO ₂ removed from the atmosphere and converted to carbon by plant photosynthesis.
NPP	Net primary productivity	The difference between GPP and Ra. The amount of CO ₂ fixed or stored in new vegetation each year.
NEP	Net ecosystems productivity	GPP – (Ra + Rh)
NBP	Net biome productivity	Ecosystems carbon losses caused by land-use and land-cover change and disturbances. The absolute change in carbon stored within ecosystems.
Fluxes: carbon emissions		
Ra	Autotrophic respiration	CO ₂ released to the atmosphere by plant respiration.
Rh	Heterotrophic respiration	CO ₂ released to the atmosphere from decay of DOM
Fire	Wildfire carbon flux	Ecosystem carbon loss as CO ₂ released to the atmosphere during wildfire.
Harvest	Forest harvest carbon flux	Ecosystem carbon loss from forest timber harvest.
Other	Other land-use/land-cover changes	Ecosystem carbon loss from land use (agricultural harvest) and land-use/land-cover change other than fire and timber harvest.

Conterminous United States

We estimated carbon stocks and fluxes in the CONUS by using the IBIS model (Foley and others, 1996; Kucharik and others, 2000). We used a modified version of the IBIS model that includes nitrogen controls on the carbon cycle (Liu and others, 2005), LULC change, wildland fire effects (Liu and others, 2011, 2016), and CH₄ emissions (Zhu and others, 2014).

IBIS includes 11 types of disturbances: (1) fire, (2) logging, (3) deforestation to grasslands and shrublands, (4) deforestation to cropland, (5) afforestation from grasslands and shrublands, (6) afforestation from agriculture, (7) urbanization from forest, (8) urbanization from grasslands and shrublands, (9) urbanization from cropland, (10) agricultural expansion from grassland and shrublands, and (11) agricultural contraction (cropland converting to grasslands and shrublands). Logging and fire events trigger carbon removal and tree mortality without changing the forest-cover fraction, allowing for forest regrowth. Other types of disturbance remove carbon from the landscape and alter land cover fractions. For example, the forest to cropland transition (deforestation) will reallocate the previous forest-cover fraction to the cropland-cover fraction and remove all forest carbon from the landscape. As a result, the following simulation year will have no forest productivity but more crop productivity owing

to the increase in the cropland-cover fraction. Other disturbance types, such as insect-induced mortality, disease, and wind and weather, were not included in this study.

Federal lands in the CONUS were identified from the USGS Protected Areas Database of the United States (PADUS) version 1.4 (U.S. Geological Survey, 2016). A mask was created by selecting all PADUS polygons that had a Federal owner designation. These included lands managed by the Bureau of Land Management, U.S. Forest Service, U.S. Department of Defense, U.S. Department of Energy, Bureau of Reclamation, U.S. Army Corps of Engineers, National Park Service, National Oceanic and Atmospheric Administration, Natural Resources Conservation Service, and other Federal agencies. American Indian Lands and Tribal lands were not included in this analysis. Within the Federal lands mask, all coastal and offshore areas were excluded. The Federal lands layer was then aggregated to a single binary map and combined with U.S. State boundaries from the U.S. Census Bureau (https://www.census.gov/geo/maps-data/data/cbf/cbf_state.html) to provide a unique State identification code for each Federal land cell. All processing was done at a spatial resolution of 960 meters (m) x 960 m using an Albers Equal-Area Conic projection. Although small changes in the extent of Federal lands may have taken place over the period of study, we assumed that the extent of Federal lands was unchanging over time.

12 Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14

We used the Federal lands mask described above to extract seven key IBIS carbon stock and flux variables: NPP, NEP, NBP, total ecosystem carbon (TEC) stock, live vegetation carbon stock, emissions associated with wildfire, and carbon removals associated with LULC change. The IBIS output data consist of annual maps of each carbon stock and flux variable at 960-m x 960-m resolution. Each map was stored as a multilayer Network Common Data Form file with each layer representing a single year between 1971 and 2015. Processing of all data was done by using the raster package (Hijmans and van Etten, 2012) of the R statistical package (R Core Team, 2013). Each of the seven IBIS-variable Network Common Data Form files was imported into R as a multilayer raster brick object, and the coordinate reference system and spatial extents were defined. Next, we extracted carbon values for Federal lands by using the Federal lands mask, and the zonal function was used to calculate the mean carbon density in kilograms per square meter for each State in each year. To estimate the total carbon value for all Federal land cells within a State, we first calculated the total number of cells with valid data extracted by the Federal lands mask and then calculated the total area in square meters for each State. The total areas were then multiplied by the carbon densities and divided by 1 billion to produce estimates of million metric tons of carbon. The carbon values were then multiplied by 3.67 to convert to million metric tons of CO₂. To facilitate comparisons with the fossil fuel-associated emissions estimates and EPA Inventory estimates, all carbon stocks and sequestration are represented as negative values and all carbon releases or losses to the atmosphere are represented as positive values.

Alaska

Estimates of ecosystem carbon dynamics in Alaska were based on the USGS biological carbon sequestration assessment for the State of Alaska (Zhu and McGuire, 2016). For the Alaska assessment, researchers estimated carbon stocks and fluxes from uplands and wetlands across a baseline period spanning 1950–2010. For both uplands and wetlands, the Dynamic Organic Soil version of the Terrestrial Ecosystem Model (DOS-TEM; Genet and others, 2013) was used to estimate carbon stocks and fluxes for 1-km x 1-km simulation cells. Soil and vegetation carbon estimates from DOS-TEM were validated against a range of in situ data collected across a range of ecosystem types. For more detail on the Alaska ecosystem modeling, see Zhu and McGuire (2016).

To estimate carbon stocks and fluxes for Federal lands in Alaska, we used spatially explicit output from DOS-TEM at 1-km spatial resolution. Spatially explicit decadal averages of five carbon parameters were obtained from the Scenarios Network for Alaska and Arctic Planning at <http://ckan.snap.uaf.edu>. Carbon flux parameters include mean annual NPP, Rh, and carbon losses owing to fire. Additionally, carbon stock estimates for soil and live vegetation were available. First, we calculated NEP by subtracting Rh from NPP. Because of data limitations, wildfire was the

only carbon loss considered when estimating NBP, which was calculated by subtracting the burn map carbon losses from the calculated NEP map. Next, all carbon maps were spatially subset to include only Federal lands. Mean decadal carbon stocks and fluxes were then added as a stationary input to the annual totals calculated for the CONUS.

Hawaii

Carbon stocks and fluxes for the State of Hawaii were estimated on the basis of an analysis of the USGS biological carbon sequestration assessment for the State of Hawaii (Selmanns and others, 2017). For the Hawaii assessment, researchers estimated mean annual carbon stocks and fluxes for forests, grasslands, and shrublands across three moisture zones (dry, mesic, wet) for the period 2001–16 (Sleeter and others, 2017) by using the Land Use and Carbon Scenario Simulator (LUCAS) model. The LUCAS model included estimates and projections of the effects of land-use change, wildfire, and future changes in moisture zones on the carbon balance of terrestrial ecosystems. The LUCAS model was run in a spatially referenced mode, and spatially explicit maps of carbon stocks and fluxes were not produced.

Live vegetation and soil organic carbon (to 1-m depth) stocks for the seven main Hawaiian Islands containing Federal lands (Hawaii, Maui, Lanai, Kahoolawe, Molokai, Oahu, and Kauai) were estimated from spatially explicit maps developed for the USGS biological carbon sequestration assessment (Selmanns and others, 2017). We then summarized the total carbon storage by intersecting the live vegetation and soil organic carbon maps with a map of Federal lands.

To estimate carbon fluxes for Federal lands in Hawaii, we extracted statewide total carbon estimates for the period 2005–15 from a “no-change” scenario (where no changes in land use, fire, or climate were considered). Carbon densities were calculated on the basis of the distribution of the combinations of LULC classes (forest, grassland, shrubland) and moisture zones (dry, mesic, wet), which were assumed to be fixed through time. Next, we calculated the area of each LULC class type for the Federal lands of Hawaii by intersecting an LULC map (Jacobi and others, 2017) with a map of Federal lands extracted from the PADUS dataset. Lastly, we applied the State-level carbon densities to the Federal lands area to estimate carbon stocks and fluxes. It is important to note that because LULC change and disturbances were not considered, only NPP, Rh and NEP were estimated for Hawaii.

Results

The carbon sequestration results were calculated for various timeframes depending on geographic area and specific output. For comparison with the fossil fuel-associated emissions, the following results are provided for the years 2005–14 only. In 2005, Federal lands of the CONUS stored 82,289 MMT CO₂ Eq. in terrestrial ecosystems (TEC). By

Terrestrial Ecosystems-Associated Carbon Emissions and Sequestration on Federal Lands 13

2014, carbon storage was estimated at 83,600 MMT CO₂ Eq., representing an increase of 1.6 percent, or 1,311 MMT CO₂ Eq. Soils stored most of the TEC (63 percent), followed by live vegetation (26 percent) and DOM (10 percent). Over the 10-year period, 400 MMT CO₂ Eq. was sequestered in live vegetation, 478 MMT CO₂ Eq. was sequestered in soils, and 433 MMT CO₂ Eq. was added to DOM pools. Average carbon storage in live vegetation and soils in Alaska was estimated at 131,675 MMT CO₂ Eq., with 92 percent stored in soils (120,618 MMT CO₂ Eq.) and 8 percent stored in live vegetation (11,057 MMT CO₂ Eq.). For the State of Hawaii, we estimated 24 MMT CO₂ Eq. was stored in live vegetation and 51 MMT CO₂ Eq. was stored in soils. On average, terrestrial ecosystems stored a combined 214,554 MMT CO₂ Eq. on Federal lands between 2005 and 2014 (table 4).

Between 2005 and 2014, Federal lands sequestered an average of 343 million metric tons of carbon dioxide equivalent per year (MMT CO₂ Eq./yr) (annual NEP), the difference between an average gain through NPP of 2,567 MMT CO₂ Eq./yr and an average loss through ecosystem Rh of 2,224 MMT CO₂ Eq./yr. Additional losses of carbon from terrestrial ecosystems resulted from wildfire (21 MMT CO₂ Eq./yr in the CONUS and 46 MMT CO₂ Eq./yr in Alaska), logging (43 MMT CO₂ Eq./yr), and other land use and land-use changes (39 MMT CO₂ Eq./yr). By subtracting the cumulative effects of LULC- and disturbance-related CO₂ losses to the atmosphere from the NEP, we estimated that ecosystems at the national level sequestered CO₂ at a mean rate of 195 MMT CO₂ Eq./yr (NBP). The amount of CO₂ sequestered offset approximately 15 percent of the CO₂ emissions resulting from

the extraction of fossil fuels on Federal lands and their end-use combustion. Federal lands in the CONUS accounted for most of the net carbon sink (177 MMT CO₂ Eq./yr), and Alaska accounted for the remainder.

Carbon sequestration on Federal lands was highly variable over time, owing primarily to interannual variability in climate and weather, long-term increases in CO₂ fertilization, and variability in LULC and disturbances (fig. 4). Between 2005 and 2014, NPP in the CONUS ranged from 1,841 to 2,283 MMT CO₂ Eq./yr. Over the same period, NBP varied between sequestering 475 MMT CO₂ Eq./yr and emitting carbon to the atmosphere at a rate of 51 MMT CO₂ Eq./yr. The large variation in the size of the land sink was due, in part, to variability in the magnitude of disturbances. For example, emissions from wildfire in the CONUS ranged from 3 MMT CO₂ Eq./yr in 2014 to 44 MMT CO₂ Eq./yr in 2012. Over the full period of the simulations (1970–2015), variability was even higher (fig. 4).

On average, Federal lands in the State of Alaska stored 131,675 MMT CO₂ Eq., with 92 percent stored in soils (120,618 MMT CO₂ Eq.) and 8 percent stored in live vegetation (11,057 MMT CO₂ Eq.). The amount of carbon stored on Federal lands in Alaska was approximately 62 percent of the total carbon stored on Federal lands, indicating Alaska's importance in the overall U.S. carbon balance. Nine States accounted for over 60 percent of the carbon storage on Federal lands in the CONUS (table 5). The largest amount was stored in Oregon, followed by California, Idaho, Montana, Nevada, Wyoming, Colorado, Washington, and Utah. Oregon stored 10.9 percent (8,985 MMT CO₂ Eq.) of the

Table 4. Carbon stocks and fluxes for Federal lands in the conterminous United States, 2005–14.

[Units are in million metric tons of carbon dioxide equivalent for stocks and million metric tons of carbon dioxide equivalent per year for fluxes. Because of rounding, averages may not add to totals shown. Negative values indicate a net carbon sink or sequestration, and positive values indicate a net carbon source to the atmosphere or emissions. Total U.S. values can be approximated by adding the average stocks and fluxes in Alaska and Hawaii (table 5) to the values presented here. TEC, total ecosystem carbon; Live, storage in live vegetation; DOM, storage in dead organic matter; Soil, storage in soils; NPP, net primary productivity; Rh, heterotrophic respiration; NEP, net ecosystems productivity; NBP, net biome productivity; Fire, carbon emissions from wildfire; Harvest, carbon loss from forest harvest; Other, carbon loss from land-use and land-cover change and harvested agricultural products. See table 3 and the text for further explanation of carbon stocks and fluxes]

Year	Carbon stocks				Carbon fluxes						
	TEC	Live	DOM	Soil	NPP	Rh	NEP	NBP	Fire	Harvest	Other
2005	-82,289	-21,270	-8,533	-52,486	-2,283	1,708	-575	-475	11	55	34
2006	-82,322	-21,090	-8,698	-52,534	-1,870	1,723	-147	-29	24	53	40
2007	-82,275	-20,889	-8,779	-52,607	-1,841	1,759	-83	51	34	53	46
2008	-82,353	-20,810	-8,870	-52,673	-1,854	1,661	-193	-75	24	56	38
2009	-82,605	-21,006	-8,875	-52,725	-2,038	1,687	-350	-249	9	59	34
2010	-82,951	-21,310	-8,871	-52,770	-2,174	1,734	-440	-342	9	55	34
2011	-83,170	-21,365	-8,982	-52,823	-1,986	1,686	-301	-219	19	25	38
2012	-83,139	-21,233	-9,033	-52,872	-1,875	1,786	-89	31	44	24	52
2013	-83,334	-21,392	-9,023	-52,919	-2,076	1,783	-293	-195	30	25	43
2014	-83,600	-21,670	-8,966	-52,964	-2,119	1,796	-323	-265	3	25	30
Average	-82,804	-21,204	-8,863	-52,737	-2,012	1,732	-279	-177	21	43	39

Table 5. Average annual carbon stocks and fluxes for onshore Federal lands in the United States, 2005–14.

[Units are in million metric tons of carbon dioxide equivalent for stocks and million metric tons of carbon dioxide equivalent per year for fluxes. Negative values indicate a net carbon sink, and positive values indicate a net carbon source to the atmosphere. TEC, total ecosystem carbon; Live, storage in live vegetation; DOM, storage in dead organic matter; Soil, storage in soils; NPP, net primary productivity; Rh, heterotrophic respiration; NEP, net ecosystems productivity; NBP, net biome productivity; Fire, carbon emissions from wildfire; Harvest, carbon loss from forest harvest; Other, carbon loss from land-use/land-cover change and harvested agricultural products, —, value not calculated. See table 3 and the text for further explanation of carbon stocks and fluxes.]

State	Carbon stocks						Carbon fluxes				
	TEC	Live	DOM	Soil	NPP	Rh	NEP	NBP	Fire	Harvest	Other
Alabama	-427.6	-201.0	-36.7	-190.0	-20.3	16.6	-3.7	-1.8	0.2	1.3	0.4
Alaska	-131,675	-11,057	—	-120,618	-552	489	-64	-18	46	—	—
Arizona	-2,129.2	-466.4	-207.1	-1,455.7	-55.3	55.5	0.2	1.9	0.7	0.3	0.7
Arkansas	-773.1	-385.6	-70.9	-316.6	-25.6	20.3	-5.3	-2.5	0.2	1.9	0.8
California	-8,387.3	-2,822.4	-1,179.7	-4,385.2	-255.9	225.2	-30.7	-14.5	5.1	2.9	8.2
Colorado	-4,363.0	-1,007.3	-481.9	-2,873.8	-96.3	79.7	-16.6	-13.8	0.4	0.5	1.9
Connecticut	-5.8	-1.2	-0.5	-4.1	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
Delaware	-44.7	-4.6	-1.4	-38.6	-0.6	0.5	-0.1	0.0	0.0	0.0	0.0
District of Columbia	-11.0	-3.3	-1.1	-6.6	-0.3	0.3	0.0	0.0	0.0	0.0	0.0
Florida	-2,546.9	-267.9	-117.6	-2,161.5	-46.0	42.8	-3.2	-0.1	1.2	0.7	1.1
Georgia	-1,636.9	-358.5	-83.9	1,194.5	-33.3	29.0	-4.3	-2.2	0.3	1.2	0.6
Hawaii	-75	-24	—	-51	-3	3	<-1	—	—	—	—
Idaho	-7,520.5	-1,866.6	-943.1	-4,710.8	-164.2	138.6	-25.6	-14.0	4.3	2.3	4.9
Illinois	-242.4	-94.5	-22.0	-125.9	-9.0	7.3	-1.7	-0.7	0.0	0.2	0.8
Indiana	-252.3	-106.8	-25.3	-120.2	-9.7	7.9	-1.8	-1.1	0.0	0.3	0.3
Iowa	-46.8	-8.1	-2.1	-36.6	-0.9	0.6	-0.3	-0.1	0.0	0.0	0.2
Kansas	-94.4	-7.3	-2.8	-84.3	-2.7	2.0	-0.7	0.0	0.1	0.0	0.6
Kentucky	-677.2	-320.2	-65.9	-291.2	-27.6	22.8	-4.8	-3.0	0.0	1.3	0.5
Louisiana	-513.6	-135.1	-23.4	-355.1	-14.4	12.2	-2.2	-0.5	0.2	1.2	0.3
Maine	-75.2	-17.9	-5.8	-51.5	-1.7	1.4	-0.3	-0.2	0.0	0.1	0.0
Maryland	-57.8	-11.4	-3.1	-43.2	-1.2	1.1	-0.2	-0.1	0.0	0.0	0.0
Massachusetts	-34.7	-4.8	-2.4	-27.5	-0.6	0.5	-0.1	0.0	0.0	0.0	0.0
Michigan	-3,194.8	-432.6	-255.4	-2,506.8	-44.5	38.9	-5.6	-3.9	0.0	1.2	0.5
Minnesota	-2,438.7	-312.4	-137.4	-1,988.9	-31.8	28.5	-3.3	-1.8	0.2	0.6	0.6
Mississippi	-659.5	-279.5	-55.8	-324.2	-31.0	25.9	-5.1	-1.7	0.4	1.9	1.0
Missouri	-705.1	-319.3	-68.3	-317.5	-20.9	16.8	-4.1	-2.4	0.1	0.7	1.0
Montana	-6,141.4	-1,768.7	-813.2	-3,559.5	-167.2	143.8	-23.5	-18.9	1.4	2.1	1.2
Nebraska	-152.7	-17.3	-9.5	-125.9	-3.6	3.1	-0.5	-0.3	0.0	0.0	0.2
Nevada	-4,882.2	-712.3	-525.7	-3,644.1	-109.2	105.1	-4.1	-0.5	1.0	0.6	2.1

Terrestrial Ecosystems-Associated Carbon Emissions and Sequestration on Federal Lands

Table 5. Average annual carbon stocks and fluxes for onshore Federal lands in the United States, 2005–14.—Continued

[Units are in million metric tons of carbon dioxide equivalent for stocks and million metric tons of carbon dioxide equivalent per year for fluxes. Negative values indicate a net carbon source to the atmosphere. TEC, total ecosystem carbon; Live, storage in live vegetation; DOM, storage in dead organic matter; Soil, storage in soils; NPP, net primary productivity; Rh, heterotrophic respiration; NEP, net ecosystems productivity; NBP, net biome productivity; Fire, carbon emissions from wildfire; Harvest, carbon loss from forest harvest; Other, carbon loss from land-use/land-cover change and harvested agricultural products, —, value not calculated. See table 3 and the text for further explanation of carbon stocks and fluxes.]

State	Carbon stocks						Carbon fluxes				
	TEC	Live	DOM	Soil	NPP	Rh	NEP	NBP	Fire	Harvest	Other
New Hampshire	-320.6	-120.2	-39.3	-161.2	-10.0	8.5	-1.5	-1.1	0.0	0.4	0.0
New Jersey	-142.0	-16.8	-6.5	-118.8	-1.9	1.7	-0.2	-0.2	0.0	0.0	0.0
New Mexico	-2,299.8	-530.6	-265.5	-1,503.7	-64.5	60.8	-3.7	-2.1	0.7	0.3	0.6
New York	-96.7	-23.1	-6.5	-67.1	-2.0	1.6	-0.3	-0.2	0.0	0.0	0.1
North Carolina	-2,906.8	-519.1	-123.9	-2,263.8	-46.2	39.1	-7.1	-4.5	0.1	1.8	0.7
North Dakota	-491.1	-35.2	-18.6	-437.4	-12.8	9.9	-2.9	-1.8	0.0	0.0	1.0
Ohio	-249.5	-116.2	-22.5	-110.8	-9.4	7.6	-1.8	-0.9	0.0	0.5	0.4
Oklahoma	-199.3	-55.5	-12.2	-131.5	-6.7	5.6	-1.1	-0.3	0.0	0.4	0.3
Oregon	-8,985.2	-2,685.8	-1,054.4	-5,245.0	-198.9	159.5	-39.4	-29.6	1.3	6.7	1.8
Pennsylvania	-247.9	-114.6	-24.8	-108.5	-8.2	6.6	-1.6	-1.2	0.0	0.3	0.1
Rhode Island	-16.0	-5.2	-1.9	-9.0	-0.4	0.4	-0.1	0.0	0.0	0.0	0.0
South Carolina	-532.8	-187.3	-39.1	-306.5	-18.8	15.9	-2.9	-1.1	0.2	1.2	0.4
South Dakota	-596.5	-102.0	-59.6	-434.9	-17.0	14.0	-3.1	-2.5	0.0	0.1	0.4
Tennessee	-586.9	-283.6	-58.8	-244.5	-23.2	19.8	-3.4	-2.3	0.1	0.6	0.5
Texas	-786.4	-199.1	-39.2	-548.0	-22.6	19.6	-3.0	-0.7	0.2	1.2	0.9
Utah	-3,581.9	-706.5	-358.4	-2,517.1	-82.8	72.0	-10.8	-8.6	0.5	0.4	1.3
Vermont	-375.6	-94.9	-32.2	-248.5	-8.2	6.9	-1.3	-0.9	0.0	0.4	0.1
Virginia	-1,255.8	-513.1	-118.2	-624.5	-45.9	39.4	-6.5	-4.2	0.1	1.4	0.7
Washington	-4,248.7	-1,703.2	-582.4	-1,963.0	-104.2	80.2	-24.0	-18.2	0.9	4.2	0.7
West Virginia	-651.8	-279.1	-69.6	-303.1	-23.7	20.1	-3.6	-2.5	0.0	0.9	0.2
Wisconsin	-1,405.1	-163.1	-75.9	-1,166.1	-16.6	14.9	-1.7	-1.1	0.0	0.4	0.2
Wyoming	-4,812.2	-816.0	-711.1	-3,285.1	-113.8	101.7	-12.1	-10.4	0.5	0.6	0.6
United States	-214,554	-32,285	-8,863	-173,406	-2,567	2,224	-343	-195	67	43	39

16 Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14

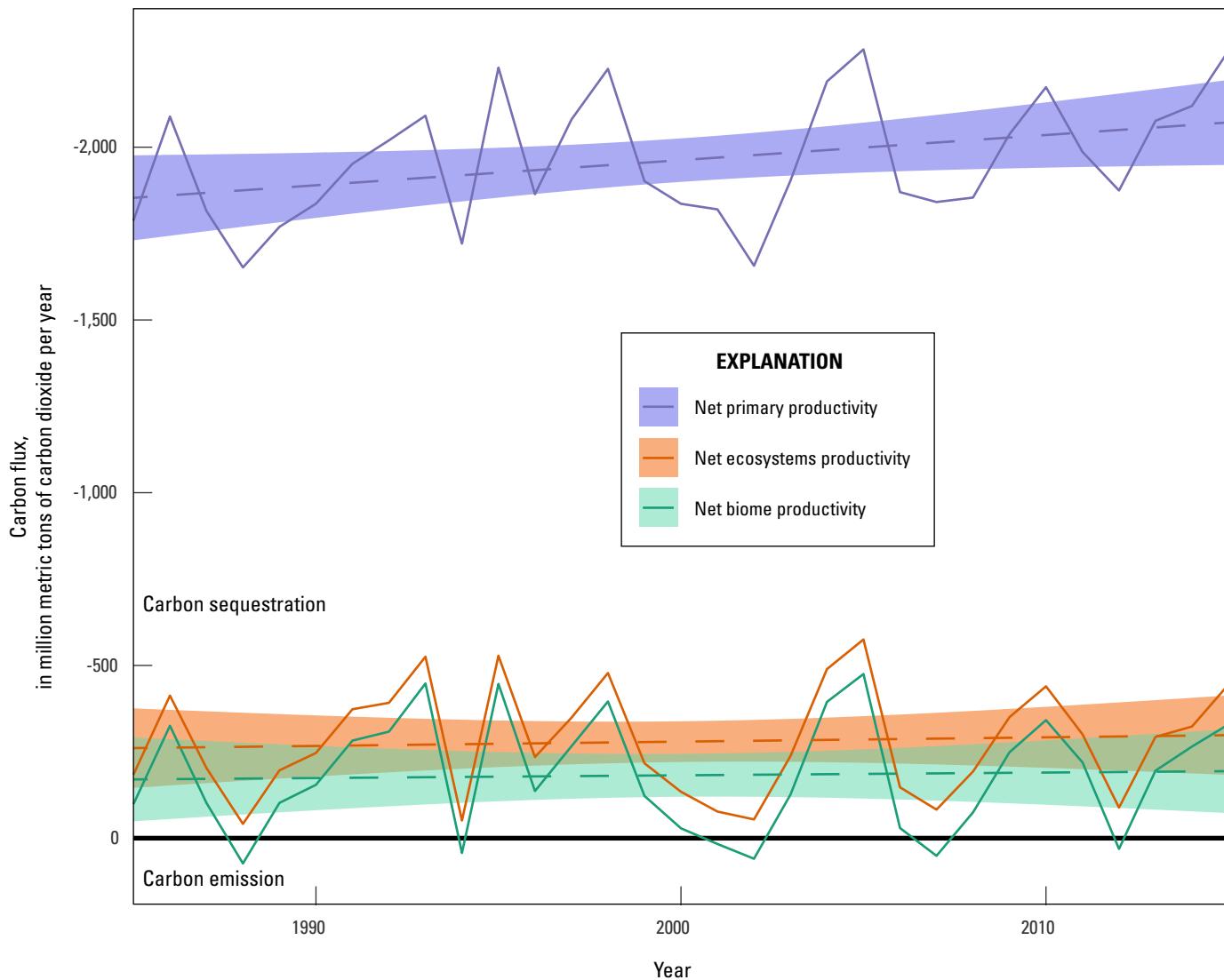


Figure 4. Graph showing estimates of annual rates of net primary productivity, net ecosystems productivity, and net biome productivity for the conterminous United States, 1985–2015. Negative values denote a net carbon sink or sequestration, and positive values denote a net carbon source to the atmosphere or emissions. Solid lines represent actual values, dashed lines are linear regression trend lines, and color bands indicate the standard error from those trend lines.

total carbon storage on Federal lands in the CONUS and accounted for 7.7 percent of the Federal land area. Conversely, Nevada accounted for the largest proportion of CONUS Federal land area (13.7 percent) but stored only 5.9 percent of the total carbon (4,882 MMT CO₂ Eq.). Of the 20 States with the largest Federal land area, the largest carbon storage densities were in North Carolina (1,736 metric tons of carbon dioxide equivalent per hectare [t CO₂ Eq./ha]), Florida (1,438 t CO₂ Eq./ha), and Michigan (1,416 t CO₂ Eq./ha), owing primarily to the formation of deep, organically rich peat soils.

Aside from Alaska (552 MMT CO₂ Eq./yr), California had the highest rate of NPP, averaging 256 MMT CO₂ Eq./yr. Nevada, which has the largest Federal land area in the

CONUS, averaged 109 MMT CO₂ Eq./yr in NPP. The difference in mean annual carbon uptake can be attributed primarily to the proportion of forest lands found in California compared with Nevada. Forests remove carbon from the atmosphere at a much higher rate than regions dominated by grasslands and shrublands. Of the States with more than 5 million hectares of Federal land area, Washington had the highest rate of carbon uptake, averaging 19 metric tons of carbon dioxide equivalent per hectare per year (t CO₂ Eq./ha/yr). The highest uptake rate overall was found in Alabama, which averaged 32 t CO₂ Eq./ha/yr.

When ecosystem respiration, LULC, and disturbances were considered, Oregon was the largest net sink (highest NBP) of carbon on Federal lands at a rate of 30 MMT CO₂ Eq./yr.

Montana sequestered 19 MMT CO₂ Eq./yr. Alaska and Washington each sequestered 18 MMT CO₂ Eq./yr., followed by California (15 MMT CO₂ Eq./yr.), Idaho (14 MMT CO₂ Eq./yr.), Colorado (14 MMT CO₂ Eq./yr.), and Wyoming (10 MMT CO₂ Eq./yr.). Alaska had the largest mean annual carbon emissions from wildfire at 46 MMT CO₂ Eq./yr., followed by California and Idaho, which averaged 5 and 4 MMT CO₂ Eq./yr., respectively. Montana, Oregon, Florida, and Nevada all averaged 1 to 2 MMT CO₂ Eq./yr. of fire emissions. The largest logging related carbon losses were found in Oregon and Washington, which averaged 7 and 4 MMT CO₂ Eq./yr., respectively.

Net Emissions and Sequestration Results

Combining the fossil fuel extraction and combustion emissions with the ecosystems emissions and sequestration estimates provides an informative summary result that includes both anthropogenic emissions and sequestration by ecosystems on Federal lands. This result is the net emissions value and is the sum of the total fossil fuel CO₂ emission value and the NBP, which is negative if carbon is stored and positive

if carbon is emitted. The NBP reflects the absolute change in carbon stored within ecosystems on an annual basis. A positive net emission result indicates that emissions are greater than sequestration, whereas a negative value indicates that sequestration is greater than emissions. Ecosystems data were calculated for the period 1970–2015, but only the results for 2005–14 are provided in this report for comparison with fossil fuel-associated emissions estimates. In addition, sequestration data were not available for the Federal offshore areas, so net emissions values are not available for the offshore Pacific and offshore Gulf areas. The Hawaii sequestration values are not calculable on an annual level and are therefore excluded from the net emissions results. The net emissions results for 2005–14 are provided in table 6.

Annual net emissions data for the United States show variations that reflect the variation in the ecosystems NBP data. These variations are described in the terrestrial ecosystems-associated carbon emissions and sequestration “Results” section. In general, fossil fuel-associated emissions data show increasing or decreasing long-term trends but not significant annual variation. Whereas most major fossil fuel-producing States have positive net emissions, some States with lesser production alternate between positive and negative net emissions because ecosystem NBP (sequestration) values may be larger than the State’s fossil fuel-associated emissions.

Table 6. Net emissions for Federal lands in the United States, 2005–14.

[All units are in million metric tons of carbon dioxide equivalent per year. Positive values indicate a net carbon emission, and negative values indicate a net carbon sequestration. Annual net biome productivity was not available for Hawaii and the offshore areas; therefore, U.S. total net emissions values are not included in this table. —, values were not calculated due to unavailability of annual terrestrial ecosystems-associated carbon emissions and sequestration]

State	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Alabama	0.2	2.9	5.6	0.9	-0.7	2.7	2.7	2.6	-2.6	-2.5
Alaska	-14.1	-14.6	-15.0	-14.9	-15.7	-16.1	-16.6	-16.8	-16.7	-16.5
Arizona	-28.8	23.9	24.3	-8.6	0	-15.6	14.8	14.4	-13.2	7.5
Arkansas	1.6	1.2	-0.9	-5	-4.2	0.9	-1.2	-0.9	-3	-5.3
California	-82.8	22.9	55.4	34.9	-22.8	-69	-24	35.2	13.4	28.6
Colorado	29.3	34.4	32.8	52.8	37.1	52.1	43.2	68.7	30.7	12.1
Connecticut	0	0	0	0	0	0	0	0	0	0.0
Delaware	-0.1	-0.1	0	0	0	0	-0.1	-0.1	-0.1	0.0
District of Columbia	-0.1	0	0	0	-0.1	0	0	0	0	-0.1
Florida	-1.6	5.4	5.4	-2.6	1.9	-3.2	3.1	-1.6	-1.8	-6.0
Georgia	-2.5	-1.2	2.7	-2.7	-5.9	-2.3	-0.4	-2.5	-4	-3.6
Hawaii	—	—	—	—	—	—	—	—	—	—
Idaho	-44.2	-7.7	7.1	0	-33.3	-38.3	-14.3	13.3	-1.3	-21.2
Illinois	-0.1	-1.2	0.1	-1.7	-1.1	0.6	-2.5	0.5	-0.9	-0.8
Indiana	-0.3	-1.8	-0.3	-2	-1.1	0.4	-2.2	-0.9	-1.3	-1.4
Iowa	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	0	0	-0.1
Kansas	0.4	0.9	0.4	0.3	0.2	0.5	0.8	0.5	0.2	0.4
Kentucky	-0.7	1	3.9	-0.7	-4.4	-0.5	-8	-5.4	-5.9	-4.3

18 Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14

Table 6. Net emissions for Federal lands in the United States, 2005–14.—Continued

[All units are in million metric tons of carbon dioxide equivalent per year. Positive values indicate a net carbon emission, and negative values indicate a net carbon sequestration. Annual net biome productivity was not available for Hawaii and the offshore areas; therefore, U.S. total net emissions values are not included in this table. —, values were not calculated due to unavailability of annual terrestrial ecosystems-associated carbon emissions and sequestration]

State	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Louisiana	115.4	108.7	112.2	84.4	87.5	83	73.5	63	59.8	53.4
Maine	-0.2	-0.3	-0.2	-0.1	-0.2	-0.2	-0.2	-0.2	-0.2	-0.2
Maryland	-0.1	-0.1	0	-0.1	-0.1	0	-0.1	-0.1	-0.1	-0.2
Massachusetts	0	-0.1	0	0	-0.1	0	0	-0.1	0	0.0
Michigan	2.7	-2.9	-1.4	-1.4	-6.5	-0.7	-8.2	-7.1	-5.3	-6.6
Minnesota	-1.9	-0.7	0.5	-2.5	-3	-2.5	-1.6	-2	-1	-3.1
Mississippi	-0.5	3.3	1.8	-1.8	-3.5	-0.5	-2.9	-4.1	-4.2	-3.5
Missouri	-0.9	-1.6	-1.2	-5	-4.6	-0.9	-2.8	-0.2	-4.5	-1.8
Montana	15.6	44.4	41	35.3	37.9	4.2	22.3	34.1	23.7	20.2
Nebraska	-0.5	0.7	0.1	-0.7	-1.1	-0.9	-0.9	1.3	0.5	-1.2
Nevada	-61.3	17.8	43.7	20.6	-18.3	-16.7	0.8	26.8	-1.9	-14.7
New Hampshire	-0.6	-1.2	-2.2	-0.4	-1	-1.2	-1.1	-1.2	-1.2	-1.1
New Jersey	-0.1	-0.2	-0.2	-0.1	-0.2	0	-0.2	-0.4	-0.4	-0.2
New Mexico	68	66.6	67.6	63.3	71	58.7	72.5	79.7	63.5	68.6
New York	-0.1	-0.3	-0.1	-0.2	-0.3	-0.1	-0.3	-0.3	-0.3	-0.3
North Carolina	-3.3	-7	-4.9	-4.6	-7.9	-3.1	-5	-6.4	0.4	-3.6
North Dakota	2.5	7.7	9.2	8.3	2.7	0.2	7	14.5	12	12.4
Offshore Gulf	—	—	—	—	—	—	—	—	—	—
Offshore Pacific	—	—	—	—	—	—	—	—	—	—
Ohio	0.2	-0.9	0.5	-1.1	-1	0.1	-2.5	-1.5	-1.2	-0.6
Oklahoma	1.9	2.4	1	1	0.9	2	2.7	1.4	0.9	0.8
Oregon	-57.7	-13.4	-23	-8.4	-20.7	-48	-38.2	-22.7	-31.5	-32.8
Pennsylvania	-0.3	-0.8	-1.4	-1.1	-0.9	-0.2	-2.3	-2.2	-1.3	-1.5
Rhode Island	-0.1	0	0	0	-0.1	-0.1	0	0	0	-0.1
South Carolina	-1.3	-0.7	1.8	-0.1	-2	-0.6	-1	-0.8	-4.5	-2.0
South Dakota	-0.5	2.2	1.4	-6.1	-3.7	-7.3	-3.5	6	-3	-9.8
Tennessee	-2.1	-1.3	1.4	-0.6	-4.6	-1.9	-4.6	-4	-2.7	-2.4
Texas	29.5	28.3	21.1	17.9	17.8	13.6	16	9.7	6.6	3.2
Utah	4.8	37.1	50.7	55	31.6	28.5	14.4	55.3	38.8	25.2
Vermont	-0.1	-0.4	-1.3	-0.1	-0.8	-1.2	-0.1	-1.7	-1.5	-1.5
Virginia	-2.2	-0.6	-1.9	-0.9	-4.3	-3.1	-10.4	-7	-6.3	-5.1
Washington	-30.1	-8.9	-15.4	-15.1	-13.2	-27.7	-16.2	-14.5	-24	-16.7
West Virginia	-0.3	-2	-1.3	-4.1	-2.5	-0.4	-5.7	-4.7	-2.3	-1.9
Wisconsin	0.4	-0.7	0.8	-1.5	-1.5	-0.4	-2.2	-2.1	-1.8	-2.2
Wyoming	736	789.6	818.2	871	814.9	836.3	824.2	783.3	708.2	701.5

Conclusions

The USGS has produced estimates of fossil fuel-associated greenhouse gas emissions and terrestrial ecosystem-associated carbon emissions and sequestration for the Federal lands of the United States for 2005–14. Emissions associated with fossil fuel extraction and end-use combustion parallel production levels. States with significant fossil fuel production from Federal lands generally have higher estimated greenhouse gas emissions. Some States are significant producers of fossil fuels from non-Federal lands (such as State and private lands), and presumably have high emissions as well, but if the production is not from Federal lands, those emissions are not estimated here. Estimates of ecosystem carbon sequestration on Federal lands show that the amounts are highly variable owing to climate and weather, wildfires, land use and land-use changes, and other factors. States with the largest forests or Federal land holdings do not necessarily have the most significant ecosystem sequestration because soils retain more carbon than living matter does and ecosystems release carbon as well as store it. These factors highlight the complexity of the ecosystem sequestration calculation that is accounted for in the estimated results. The combined or net emission values included in this report are an informative, though simplistic, way of combining the two estimates.

These results are not intended or appropriate for ranking or comparing the States for many reasons. Firstly, the proportion of Federal lands to total lands varies considerably across each State. Secondly, these estimates report fossil fuel-associated emissions by the State of origin rather than the State where the emissions occurred. The data required to track all fossil fuels to their location of eventual end-use combustion are not available because of the structure of the United States' energy and industrial infrastructure. Thirdly, this study addresses the Federal lands-based scope that was given to the USGS; it was not designed to produce results for comparing States.

These USGS estimates provide a first-of-its-kind accounting for the emissions associated with fossil fuel extraction on Federal lands, the end-use combustion of those fuels, and the ecosystems sequestration and emissions of carbon on Federal lands. This information may provide context for future energy decisions, as well as serve as a reference to compare future changes in greenhouse gas emissions and carbon sequestration on Federal lands.

References Cited

Bureau of Ocean Energy Management, 2011, BOEM Pacific active oil and gas platforms: Bureau of Ocean Energy Management vector digital data, accessed March 21, 2017, at <https://www.boem.gov/PC-plat.zip>.

- Bureau of Safety and Environmental Enforcement, 2014, Outer Continental Shelf oil and natural gas platforms—Gulf of Mexico region NAD 27: Bureau of Safety and Environmental Enforcement vector digital data, accessed March 21, 2017, at <https://www.data.boem.gov/Mapping/Files/platform.zip>.
- Foley, J.A., Prentice, I.C., Ramunkutty, N., Levis, S., Pollard, D., Sitch, S., and Haxeltine, A., 1996, An integrated biosphere model of land surface processes, terrestrial carbon balance, and vegetation dynamics: Global Biogeochemistry Cycles, v. 10, no. 4, p. 603–628. [Also available at <https://doi.org/10.1029/96GB02692>.]
- Franklin, P., Scheehle, E., Collings, R.C., Coté, M.M., and Pilcher, R.C., 2004, Proposed methodology for estimating emission inventories from abandoned coal mines—Prepared for the 2006 IPCC [Intergovernmental Panel on Climate Change] National Greenhouse Gas Inventories Guidelines, Fourth Authors/Experts Meeting, Energy—Methane Emissions for Coal Mining and Handling, Arusha, Tanzania, [Sept. 28–30, 2004]: U.S. Environmental Protection Agency white paper, variously paged, accessed May 2, 2017, at https://www.epa.gov/sites/production/files/2016-03/documents/methodology_abandoned_coalmines.pdf.
- Genet, H., McGuire, A.D., Barrett, K., Breen, A., Euskirchen, E.S., Johnstone, J.F., Kasischke, E.S., Melvin, A.M., Bennett, A., Mack, M.C., Rupp, T.S., Schuur, E.A.G., Turetsky, M.R., and Yuan, F., 2013, Modeling the effects of fire severity and climate warming on active layer thickness and soil carbon storage of black spruce forests across the landscape in interior Alaska: Environmental Research Letters, v. 8, no. 4, letter 045016, 13 p., accessed July 25, 2018, at <http://dx.doi.org/10.1088/1748-9326/8/4/045016>.
- Hijmans, R.J., and van Etten, J., 2012, Raster—Geographic analysis and modeling with raster data: R package version 2.0–12 (September 2, 2012), at <http://CRAN.R-project.org/package=raster>.
- Intergovernmental Panel on Climate Change, 2006, 2006 IPCC guidelines for national greenhouse gas inventories [Prepared by the National Greenhouse Gas Inventories Programme; Eggleston, H.S., Buendia, L., Miwa, K., Ngara, T., and Tanabe, K., eds.]: Hayama, Japan, Institute for Global Environmental Strategies, 5 v., accessed May 20, 2016, at <http://www.ipcc-npp.iges.or.jp/public/2006gl/index.html>.
- Intergovernmental Panel on Climate Change, 2007, Climate change 2007—The physical science basis—Contribution of Working Group I to the fourth assessment report of the Intergovernmental Panel on Climate Change [Solomon, S., Qin, D., Manning, M., Marquis, M., Averyt, K., Tignor, M.M.B., Miller, H.L., Jr., and Chen, Z., eds.]: New York, Cambridge University Press, 996 p. [Also available at https://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4_wg1_full_report.pdf.]

20 Federal Lands Greenhouse Gas Emissions and Sequestration in the United States: Estimates for 2005–14

- Jacobi, J.D., Price, J.P., Fortini, L.B., Gon, S.M., III, and Berkowitz, P., 2017, Baseline land cover, chap. 2 of Selmants, P.C., Giardina, C.P., Jacobi, J.D., and Zhu, Z., eds., Baseline and projected future carbon storage and carbon fluxes in ecosystems of Hawai‘i: U.S. Geological Survey Professional Paper 1834, p. 9–20. [Also available at <https://doi.org/10.3133/pp1834>.]
- Kucharik, C.J., Foley, J.A., Delire, C., Fisher, V.A., Coe, M.T., Lenters, J.D., Young-Molling, C., Ramankutty, N., Norman, J.M., and Gower, S.T., 2000, Testing the performance of a dynamic global ecosystem model—Water balance, carbon balance, and vegetation structure: Global Biogeochemical Cycles, v. 14, no. 3, p. 795–825. [Also available at <https://doi.org/10.1029/1999GB001138>.]
- Liu, J., Price, D.T., and Chen, J.M., 2005, Nitrogen controls on ecosystem carbon sequestration—A model implementation and application to Saskatchewan, Canada: Ecological Modelling, v. 186, no. 2, p. 178–195. [Also available at <https://doi.org/10.1016/j.ecolmodel.2005.01.036>.]
- Liu, J., Sleeter, B.M., Zhu, Z., Heath, L.S., Tan, Z., Wilson, T.S., Sherba, J., and Zhou, D., 2016, Estimating carbon sequestration in the Piedmont ecoregion of the United States from 1971 to 2010: Carbon Balance and Management, v. 11, 13 p. [Also available at <https://doi.org/10.1186/s13021-016-0052-y>.]
- Liu, J., Vogelmann, J.E., Zhu, Z., Key, C.H., Sleeter, B.M., Price, D.T., Chen, J.M., Cochrane, M.A., Eidenshink, J.C., Howard, S.M., Bliss, N.B., and Jiang, H., 2011, Estimating California ecosystem carbon change using process model and land cover disturbance data—1951–2000: Ecological Modelling, v. 222, no. 14, p. 2333–2341. [Also available at <https://doi.org/10.1016/j.ecolmodel.2011.03.042>.]
- Merrill, M.D., Sleeter, B.M., Freeman, P.A., Liu, J., Warwick, P.D., and Reed, B.C., 2018, Federal lands greenhouse gas emissions and sequestration—Estimates 2005–14—Data release: U.S. Geological Survey data release, <https://doi.org/10.5066/F7KH0MK4>.
- Minerals Management Service, 2006a, Digital Offshore Cadastre (DOC)—Gulf of Mexico Federal Outer Continental Shelf (OCS) administrative boundaries (preliminary): Minerals Management Service vector digital data, accessed March 21, 2017, at <http://www.mms.gov/ld/lateral.htm>. [Dataset moved by time of publication; accessed August 14, 2018, at <https://www.boem.gov/Administrative-Boundaries/>.]
- Minerals Management Service, 2006b, Digital Offshore Cadastre (DOC)—Pacific Federal Outer Continental Shelf (OCS) administrative boundaries (preliminary): Minerals Management Service vector digital data, accessed March 21, 2017, at <http://www.mms.gov/ld/lateral.htm>. [Dataset moved by time of publication; accessed August 14, 2018, at <https://www.boem.gov/Administrative-Boundaries/>.]
- R Core Team, 2013, R—A language and environment for statistical computing: Vienna, Austria, R Foundation for Statistical Computing, at <http://www.R-project.org/>.
- Selmants, P.C., Giardina, C.P., Jacobi, J.D., and Zhu, Z., eds., 2017, Baseline and projected future carbon storage and carbon fluxes in ecosystems of Hawai‘i: U.S. Geological Survey Professional Paper 1834, 134 p.. [Also available at <https://doi.org/10.3133/pp1834>.]
- Sleeter, B.M., Liu, J., Daniel, C.J., Hawbaker, T.J., Wilson, T.S., Fortini, L.B., Jacobi, J.D., Selmants, P.C., Giardina, C.P., Litton, C.M., and Hughes, R.F., 2017, Projected future carbon storage and carbon fluxes in terrestrial ecosystems of Hawai‘i from changes in climate, land use, and disturbance, chap. 8 of Selmants, P.C., Giardina, C.P., Jacobi, J.D., and Zhu, Z., eds., Baseline and projected future carbon storage and carbon fluxes in ecosystems of Hawai‘i: U.S. Geological Survey Professional Paper 1834, p. 107–128. [Also available at <https://doi.org/10.3133/pp1834>.]
- U.S. Energy Information Administration, 2015a, Sales of fossil fuels produced from Federal and Indian lands, FY 2003 through FY 2014: Washington, D.C., U.S. Energy Information Administration, 32 p. [Also available at <https://www.eia.gov/analysis/requests/federallands/pdf/eia-federallandsales.pdf>.]
- U.S. Energy Information Administration, 2015b, Table 1, U.S. supply, disposition, and ending stocks of crude oil and petroleum products, 2014, in Petroleum supply annual, v. 1: U.S. Energy Information Administration, 1 p., accessed April 12, 2017, at https://www.eia.gov/petroleum/supply/annual/volume1/archive/2014/psa_volume1_2014.cfm.
- U.S. Energy Information Administration, 2015c, Table 23, percent yield of petroleum products by PAD and refining districts, 2014, in Petroleum supply annual, v. 1: U.S. Energy Information Administration, 1 p., accessed April 12, 2017, at https://www.eia.gov/petroleum/supply/annual/volume1/archive/2014/psa_volume1_2014.cfm.
- U.S. Energy Information Administration, 2016a, Annual coal distribution report 2014, by coal origin State: U.S. Energy Information Administration, 47 p., accessed February 13, 2017, at http://www.eia.gov/coal/distribution/annual/archive/2014/o_14state.pdf.

U.S. Energy Information Administration, 2016b, Monthly energy review, July 2016: U.S. Energy Information Administration [report] DOE/EIA-0035 (2016/07), 224 p., accessed September 22, 2016, at <http://www.eia.gov/totalenergy/data/monthly>.

U.S. Environmental Protection Agency, 2004, Methane emissions from abandoned coal mines in the United States—Emissions inventory methodology and 1990–2002 emissions estimates: U.S. Environmental Protection Agency [report] EPA 430-R-04-001, 54 p. [Also available at <https://nepis.epa.gov/Exe/ZyPDF.cgi/600004JM.PDF?Dockey=600004JM.PDF>.]

U.S. Environmental Protection Agency, 2015, Inventory of U.S. greenhouse gas emissions and sinks 1990–2013—Revision to offshore platform emissions estimate: Washington, D.C., U.S. Environmental Protection Agency, 3 p., accessed April 5, 2017, at <https://www.epa.gov/sites/production/files/2015-12/documents/revision-offshoreplatforms-emissions-estimate-4-10-2015.pdf>.

U.S. Environmental Protection Agency, 2016a, Annexes to the inventory of U.S. GHG emissions and sinks [— to accompany U.S. Environmental Protection Agency, Inventory of U.S. greenhouse gas emissions and sinks—1990–2014, [report] EPA 430-R-16-002]: U.S. Environmental Protection Agency, 494 p., accessed April 5, 2017, at <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2014>.

U.S. Environmental Protection Agency, 2016b, Inventory of U.S. greenhouse gas emissions and sinks—1990–2014: U.S. Environmental Protection Agency [report] EPA 430-R-16-002, variously paged, plus additional online data tables, accessed April 5, 2017, at <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2014>.

U.S. Geological Survey, 2016, Protected Areas Database of the United States, version 1.4: U.S. Geological Survey Gap Analysis Program database, accessed September 16, 2017, at <http://gapanalysis.usgs.gov/padus/>.

Zhu, Q., Liu, J., Peng, C., Chen, H., Fang, X., Jiang, H., Yang, G., Zhu, D., Wang, W., and Zhou, X., 2014, Modelling methane emissions from natural wetlands by development and application of the TRIPLEX-GHG model: Geoscientific Model Development, v. 7, p. 981–999. [Also available at <https://doi.org/10.5194/gmd-7-981-2014>.]

Zhu, Z., and McGuire, A.D., eds., 2016, Baseline and projected future carbon storage and greenhouse-gas fluxes in ecosystems of Alaska: U.S. Geological Survey Professional Paper 1826, 196 p. [Also available at <https://doi.org/10.3133/pp1826>.]

Glossary

[See also table 3, “Explanation of carbon stock and flux terms from the terrestrial ecosystem sequestration calculations”]

abandoned coal mine emissions Emissions of methane, such as from offgassing or desorption, occurring after the cessation of extraction activities at a surface or underground coal mine.

active coal mine emissions Emissions of methane from ongoing extraction activities at a surface or underground coal mine.

combustion The process of burning fossil fuels to release energy.

emission factor A value that describes the greenhouse gas content of a fuel used in a particular sector of the economy or that indicates the amount of greenhouse gas emitted by a particular extraction activity.

estimated emissions Calculated estimates of greenhouse gases released by activities in various sectors of the economy.

estimated uptake Calculated estimates of carbon (represented in equivalent amounts of carbon dioxide, a greenhouse gas) sequestered or stored in plants and other organisms.

exported fuels emissions Emissions of greenhouse gases from coal, natural gas, and liquid petroleum products exported to other countries.

Federal lands Lands that are administered by various agencies of the U.S. Federal Government.

Federal offshore Areas seaward of State waters boundaries that are under the administration of the Bureau of Ocean Energy Management. Examples include the offshore Pacific area and offshore Gulf area.

fossil fuel A natural hydrocarbon material that is extracted and then combusted to release energy. Examples include coal, natural gas, crude oil, and various liquid petroleum products.

greenhouse gas Gases that cause the amount of solar thermal energy retained by the Earth’s atmosphere to increase when their concentrations increase. The greenhouse gases discussed in this report are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

mine abandonment The process by which an underground coal mine is closed. Examples include sealing, venting, and flooding. The abandonment process determines the emission factor used to calculate the amount of methane gas released from the abandoned mine over time.

mobile combustion emissions Emissions of greenhouse gases from fossil fuel combustion in the transportation sector.

petroleum and natural gas systems emissions Emissions of greenhouse gases from ongoing extraction activities and product transportation in the petroleum and natural gas industries.

stationary combustion emissions Emissions of greenhouse gases produced during the combustion of fossil fuels in all nontransportation sectors, including electricity generation, industrial feedstocks, and residential and commercial heating.

Appendices 1–2

Appendix 1. Detailed Methods: Fossil Fuel-Associated Emissions of Greenhouse Gases from Federal Lands

Introduction

The methods described in this appendix are either very similar to those described in, or use outputs from, the U.S. Environmental Protection Agency (EPA) Inventory of U.S. Greenhouse Gas Emissions and Sinks (hereafter EPA Inventory; U.S. Environmental Protection Agency, 2016b). The methods were modified to suit the goals of this U.S. Geological Survey (USGS) study. Therefore, the EPA Inventory and associated annexes (U.S. Environmental Protection Agency, 2016a, b) are the best sources for the general methods described here. This description highlights general steps, sources for inputs, and areas where the USGS method differs from that of the EPA Inventory. Tables 1–1 through 1–6 include summary information on the sources for all input data used.

Stationary Combustion Emissions

Estimates of stationary combustion emissions for coal were calculated by using total State production volumes obtained from the Office of Natural Resources Revenue (ONRR) of the U.S. Department of the Interior via Memorandum of Agreement MOA16–5285. The production volumes were reduced to account for the coal that was exported in each year. The amount of coal produced on Federal lands and then exported was estimated by using the ratio of total State coal (private, State, and Federal combined) exported internationally to total State coal produced (U.S. Energy Information Administration, 2016a). Once the exports were subtracted from State production, the resulting amount was apportioned to the various sectors where coal is used domestically. For all coal sectors (electricity generation, commercial, industrial, and coking coal production), a basic process was followed. The State production minus exports was multiplied by State-level sector proportions that determined the “sector coal,” or how much of the total coal was used in each sector (U.S. Energy Information Administration, 2016a). In the final step, the sector coal amounts were multiplied by carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) emission factors to estimate the amounts of gases emitted. The emission factors used are specific to each sector and were reported by the EPA (U.S. Environmental Protection Agency, 2014) and references therein.

The method used to estimate emissions for natural gas follows the same general method described above for coal. The ONRR production data were the starting point. Data on dry gas production and exports are from the U.S. Energy Information Administration (EIA) (U.S. Energy Information Administration, 2016b). Sector proportions for industrial non-fuel use are from the EIA Manufacturing Energy Consumption Survey (U.S. Energy Information Administration, 2013),

which is released every 5 years. All remaining natural gas was apportioned to a stationary combustion fuel-use sector. The EPA provided one set of emission factors for the stationary combustion of natural gas (U.S. Environmental Protection Agency, 2014). The amount of industrial nonfuel natural gas was reduced by a storage factor to account for the proportion of the natural gas that served as feedstock rather than being combusted (U.S. Environmental Protection Agency, 2016a).

Estimation of emissions from the combustion of various petroleum products started with crude oil production data provided by the ONRR. The crude oil volumes were converted to total State production volumes of refined products using national-level refining data (U.S. Energy Information Administration, 2015b). State-level refining information is not available for liquid fuels owing to the comingled nature of liquid fuel transportation in pipelines. Exports were subtracted from the total volumes (U.S. Energy Information Administration, 2015a), and the resulting volumes were apportioned to end-use sectors by using sector proportion data obtained from the EIA Monthly Energy Review (U.S. Energy Information Administration, 2016b). Lastly, the sector-specific petroleum product volumes were multiplied by the CO_2 , CH_4 , and N_2O emission factors for each sector from the EPA (U.S. Environmental Protection Agency, 2014). See table 1–1 for the inputs and sources mentioned in this section.

Mobile Sector Combustion Emissions

Estimates of emissions associated with combustion from mobile (transportation) uses were generated from ratios of emissions to fuel volumes combusted as reported by the EPA Inventory (U.S. Environmental Protection Agency, 2016b). Crude oil production volumes from the Federal lands in each State were obtained from the ONRR. The crude oil data were partitioned into estimated petroleum products (for example, gasoline, diesel oil, jet fuel, lubricants) on the basis of national refining products data (U.S. Energy Information Administration, 2015b). Export amounts were obtained from the EIA Petroleum Supply Annual (U.S. Energy Information Administration, 2015a). It was assumed that the national export ratios are the same as the export ratios for petroleum produced from Federal lands. Sector use information for each fuel was used to determine the proportions that were consumed in mobile uses (U.S. Energy Information Administration, 2016b).

The ratios of the U.S. annual emissions of CO_2 , CH_4 , and N_2O (U.S. Environmental Protection Agency, 2016b) to the annual mobile fuel consumption (U.S. Environmental Protection Agency, 2016a) provided values of emissions per gallon of fuel consumed (by gas and type of fuel). These values were multiplied by the volumes of fuels sourced from Federal lands and consumed domestically to estimate the emissions for each

fuel. This method reasonably assumes that the national emissions ratios are representative of the emissions ratios expected for fuels from Federal lands. See table 1–2 for the inputs and sources mentioned in this section.

Petroleum and Natural Gas Systems Emissions

Total national emissions from petroleum and natural gas systems (CO_2 and CH_4 emitted from production through distribution) (U.S. Environmental Protection Agency, 2016b) were divided by the national oil and natural gas well counts (U.S. Environmental Protection Agency, 2017a, b), resulting in ratios of CO_2 and CH_4 emissions per well for petroleum and natural gas systems. These national ratios were then multiplied by the numbers of Federal producing oil and gas wells in a State to estimate emissions. For the years included in this study (2005–14), State-level Federal lands well counts were available for 2014 only (Bureau of Land Management, written commun., 2016). To generate Federal lands well counts for

other years, the 2014 State Federal lands wells were divided by the total State wells, to produce a State-specific Federal lands to total well ratio. This ratio was then used to approximate State Federal lands wells counts from available annual State well totals.

A time series of producing natural gas wells by State for 2005–14 was available from the U.S. Energy Information Administration (2016c). A similar time series of oil wells by State was not available for the study period, so various sources were compiled. Oil well counts for 2005–8 were from the U.S. Energy Information Administration (2009). Oil well counts for 2009–10 and 2013–14 came from World Oil (World Oil, 2011, 2014; Abraham, 2015; Jordan, 2016). State data were not readily available for 2011 and 2012, so trendlines fit to the data were used to estimate missing values. However, as of the time of publication of this study, State oil well data are now available through the EIA’s “U.S. Oil and Natural Gas Wells by Production Rate” report (U.S. Energy Information Administration, 2017).

Table 1–1. Inputs and sources for the stationary combustion greenhouse gas emissions estimate.

Input	Source
Coal, crude oil, and natural gas production volumes from Federal lands	Office of Natural Resources Revenue, data obtained via Memorandum of Agreement MOA16–5285
Coal: export data	U.S. Energy Information Administration, 2016a
Coal: sector use proportions	U.S. Energy Information Administration, 2016a
Coal: sector-specific emission factors	U.S. Environmental Protection Agency, 2014
Natural gas: export data	U.S. Energy Information Administration, 2016b, table 4.1
Natural gas: sector use proportions	U.S. Energy Information Administration, 2013
Natural gas: emission factors	U.S. Environmental Protection Agency, 2014
Natural gas: nonenergy storage factor	U.S. Environmental Protection Agency, 2016a, table A–62
Petroleum products: refining data	U.S. Energy Information Administration, 2015b
Petroleum products: export data	U.S. Energy Information Administration, 2015a
Petroleum products: sector use proportions	U.S. Energy Information Administration, 2016b, tables 3.5 and 3.7
Petroleum products: sector-specific emission factors	U.S. Environmental Protection Agency, 2014

Table 1–2. Inputs and sources for the mobile sector combustion greenhouse gas emissions estimate.

Input	Source
Crude oil production volumes from Federal lands	Office of Natural Resources Revenue, data obtained via Memorandum of Agreement MOA16–5285
Petroleum products: refining data	U.S. Energy Information Administration, 2015b
Petroleum products: export data	U.S. Energy Information Administration, 2015a
Petroleum products: sector use proportions	U.S. Energy Information Administration, 2016b, tables 3.5 and 3.7
Annual mobile fuel consumption	U.S. Environmental Protection Agency, 2016a, table A–92
Annual carbon dioxide mobile emissions	U.S. Environmental Protection Agency, 2016b, table 3–12
Annual methane mobile emissions	U.S. Environmental Protection Agency, 2016b, table 3–13
Annual nitrous oxide mobile emissions	U.S. Environmental Protection Agency, 2016b, table 3–14

26 Federal Lands Greenhouse Gas Emissions and Carbon Sequestration in the United States: Estimates for 2005–14

To quantify the variation between the data used for this study and the newly available and complete time series data from the EIA, consider the comparison of Wyoming well counts from both datasets. Oil well counts from this study and the new data are nearly identical for the period 2005–8. Variation from 2010 to 2014 was evident: the study dataset oil well counts are on average 14 percent lower than the EIA dataset. Conversely, gas well counts from this study and the new data are nearly identical from 2010 to 2014. Study dataset gas well counts are on average 15 percent lower than the new dataset from 2005 to 2008. These variations are due to differing gas-oil ratios used to define well type, methods of accepting data from States, and State reporting schedules.

To review, all well counts in the new EIA dataset are higher or unchanged compared to those used in this study. If the new dataset had been available during the analysis phase, its use would have resulted in a lower ratio of State Federal lands wells to total State wells, therefore reducing the onshore emissions for petroleum and natural gas systems attributed to activities on Federal lands. Using this new dataset would be a methodological improvement; however, in terms of significance, note that the EPA's uncertainty on the emissions estimate is –25 to 45 percent and that the methods for estimating emissions are an area of rapidly evolving science.

Total offshore oil and gas platform counts were obtained from the EPA (U.S. Environmental Protection Agency, 2017a, b). The total platform counts were split into offshore Pacific and offshore Gulf counts by subtracting the estimated number of Pacific platforms (a relatively small number) from the EPA's totals. The 2011 Pacific drilling platform counts are from Bureau of Ocean Energy Management (Bureau of Ocean Energy Management, 2011) available on the National Oceanic and Atmospheric Administration-hosted Marine Cadastre website. These platform counts were used for all years in the estimate (2005–14) because historical data were not available. The depths and types (oil versus gas) of the offshore Pacific platforms were determined by using National Oceanic and Atmospheric Administration spatial bathymetry data (National Oceanic and Atmospheric Administration, 2013) and proprietary USGS oil and gas databases.

This report follows guidance from the EPA (U.S. Environmental Protection Agency, 2015) on emission factors for offshore platforms. Those factors originate from the Gulf Offshore Activity Data System and are based on emissions reported for 2011 (Wilson and others, 2014). For further information on the choice of emission factors, consult the EPA guidance (U.S. Environmental Protection Agency, 2015). Estimates of emissions from offshore platforms vary over the years included in this estimate (2005–14) because reporting initiatives, emissions research, and on-site improvements continue to develop. Newer estimates of emissions from offshore production are available from the Gulf Offshore Activity Data System (Wilson and others, 2017). The emission factors used here are specific to both the water depth—deep, depths greater than 656 feet (200 meters); shallow, depths less than 656 feet (200 meters)—and the main hydrocarbon produced (oil or gas). The number

of platforms in each depth and product category was multiplied by the emission factors to generate the estimate. See table 1–3 for the inputs and sources mentioned in this section.

Active Coal Mine Emissions

Emissions of CH_4 from active underground coal mines were calculated as the sum of four kinds of emissions: ventilation, degasification, recovered/used, and postmining. Emissions of CH_4 from ventilation and degasification, as well as amounts of CH_4 recovered, are measured directly by the Mine Safety and Health Administration or reported by mine operators (the larger value was used when both measures were available). For underground mines, postmining CH_4 emissions are the product of annual production, the basin-specific in situ coal CH_4 content, and a fixed postmining emission factor of 0.325 (U.S. Environmental Protection Agency, 2016a).

Active surface mine emissions of CH_4 are the product of annual production, basin-specific in situ coal CH_4 content, and a fixed surface mining emission factor of 1.5 (U.S. Environmental Protection Agency, 2016a). The method for estimating postmining emissions for active surface mines is the same as that described above for post-mining emissions for active underground mines. See table 1–4 for the inputs and sources mentioned in this section.

Abandoned Coal Mine Emissions

The CH_4 emissions from abandoned underground coal mines were calculated with an emissions decline curve that used the active emissions on the day of abandonment as the starting point. The variables that control the type of decline curve are specific to the method of abandonment (sealing, venting, or flooding). Emissions from mines with an unknown abandonment method were determined by calculating the emissions for all three methods of abandonment and then using a weighted average of the outputs based on region-specific abandonment-method statistics. The EPA's methodology (Franklin and others, 2004; U.S. Environmental Protection Agency, 2004) for abandoned mines was the general method applied. However, unlike the EPA's probabilistic approach, this USGS estimate is deterministic and was obtained by using single region-specific median inputs in the decline curve calculations rather than a range of potential values. This simplification does not significantly affect the results and is in line with the simplified approach used in the USGS estimate. See table 1–5 for the inputs and sources mentioned in this section.

Exported Fuels Emissions

Emissions associated with exported fuels were estimated using the same methods as the domestic stationary and mobile combustion calculations. See those sections of this appendix for details. The portion of the fuel produced from Federal lands that was used in this calculation was based on export information from the EIA (table 1–6).

Table 1–3. Inputs and sources for the petroleum and natural gas systems greenhouse gas emissions estimate.[CO₂, carbon dioxide; CH₄, methane]

Input	Source
CO ₂ and CH ₄ natural gas systems emissions	U.S. Environmental Protection Agency, 2016b, tables 3–46 and 3–49
CO ₂ and CH ₄ petroleum systems emissions	U.S. Environmental Protection Agency, 2016b, tables 3–38 and 3–36
National Producing oil and gas well counts	U.S. Environmental Protection Agency, 2017a, b
State Producing oil well counts	U.S. Energy Information Administration, 2009; World Oil, 2011, 2014; Abraham, 2015; Jordan, 2016
State Producing gas well counts	U.S. Energy Information Administration, 2016c, table 5
State Federal lands producing oil and gas well counts	Bureau of Land Management, written commun., 2016
Offshore platform emission factors	U.S. Environmental Protection Agency, 2015, table 1
Total offshore platform counts	U.S. Environmental Protection Agency, 2017a, b
Pacific offshore platform counts	Bureau of Ocean Energy Management, 2011

Table 1–4. Inputs and sources for the active coal mining greenhouse gas emissions estimate.[CH₄, methane]

Input	Source
Production, fuel type, and basin information	Office of Natural Resources Revenue, data obtained via Memorandum of Agreement MOA16–5285
Basin-specific in situ coal CH ₄ content	U.S. Environmental Protection Agency, 2016a, table A–123
Annual ventilation CH ₄ volumes	U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks project team, written commun., 2016 (data reported by the Mine Safety and Health Administration)
Annual degasification CH ₄ volumes	U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks project team, written commun., 2016 (data reported by the Mine Safety and Health Administration)
Annual recovered/used CH ₄ volumes	U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks project team, written commun., 2016 (data reported by the Mine Safety and Health Administration)
Postmining emission factors	U.S. Environmental Protection Agency, 2016a, table A–123

Table 1–5. Inputs and sources for the abandoned coal mine greenhouse gas emissions estimate.

Input	Source
Abandoned Federal lease mines	U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks project team, written commun., 2016; John Hovanec, Office of Natural Resources Revenue, written commun., 2016
Date of abandonment	U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks project team, written commun., 2016 (data reported by the Mine Safety and Health Administration)
Average emissions at abandonment	U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks project team, written commun., 2016 (data reported by the Mine Safety and Health Administration)
Abandonment method	U.S. Environmental Protection Agency, Inventory of U.S. Greenhouse Gas Emissions and Sinks project team, written commun., 2016 (data reported by the Mine Safety and Health Administration)
Decline curve values	Franklin and others 2004; U.S. Environmental Protection Agency, 2004
Abandonment method by basin	Franklin and others, 2004; U.S. Environmental Protection Agency, 2004

28 Federal Lands Greenhouse Gas Emissions and Carbon Sequestration in the United States: Estimates for 2005–14

Table 1–6. Inputs and sources for the exported fuels greenhouse gas emissions estimate.

Input	Source
Coal export data	U.S. Energy Information Administration, 2016a
Natural gas export data	U.S. Energy Information Administration, 2016b
Petroleum products export data	U.S. Energy Information Administration, 2015a

References Cited

- Abraham, K., 2015, Active U.S. oil wells pass the 600,000 mark: World Oil, v. 236, no. 2, 1 p., accessed August 14, 2018, at <https://www.worldoil.com/magazine/2015/february-2015/special-focus/active-us-oil-wells-pass-the-600-000-mark>.
- Bureau of Ocean Energy Management, 2011, BOEM Pacific active oil and gas platforms: Bureau of Ocean Energy Management vector digital data, accessed March 21, 2017, at <https://www.boem.gov/PC-plat.zip>.
- Franklin, P., Scheehle, E., Collings, R.C., Coté, M.M., and Pilcher, R.C., 2004, Proposed methodology for estimating emission inventories from abandoned coal mines—Prepared for the 2006 IPCC [Intergovernmental Panel on Climate Change] National Greenhouse Gas Inventories Guidelines, Fourth Authors/Experts Meeting, Energy—Methane Emissions for Coal Mining and Handling, Arusha, Tanzania, [Sept. 28–30, 2004]: U.S. Environmental Protection Agency white paper, variously paged, accessed May 2, 2017, at https://www.epa.gov/sites/production/files/2016-03/documents/methodology_abandoned_coalmines.pdf.
- Jordan, R., 2016, Producing oil wells tick down as price begins to hit: World Oil Magazine, v. 237, no. 2, 1 p., accessed February 9, 2017, at <https://www.worldoil.com/magazine/2016/february-2016/special-focus/producing-oil-wells-tick-down-as-price-begins-to-hit>.
- National Oceanic and Atmospheric Administration, 2013, Bathymetric contours: National Oceanic and Atmospheric Administration vector digital data, accessed June 25, 2017, at <http://www.marinecadastre.gov/data/default.aspx>. [Dataset moved by time of publication; accessed September 12, 2018, at <https://import.nmfs.noaa.gov/import/item/48852>.]
- U.S. Energy Information Administration, 2009, United States total distribution of wells by production rate bracket—United States total 2009: U.S. Energy Information Administration dataset, accessed January 3, 2017, at http://www.eia.gov/pub/oil_gas/petrosystem/us_table.html.
- U.S. Energy Information Administration, 2013, Table 2.1, nonfuel (feedstock) use of combustible energy, 2010, in Manufacturing energy consumption survey (MECS)—2010 MECS survey data: U.S. Energy Information Administration, 8 p., accessed May 20, 2016, at <https://www.eia.gov/consumption/manufacturing/data/2010/>, under “Energy Used as a Nonfuel (Feedstock)” tab.
- U.S. Energy Information Administration, 2015a, Table 1, U.S. supply, disposition, and ending stocks of crude oil and petroleum products, 2014, in Petroleum supply annual, v. 1: U.S. Energy Information Administration, 1 p., accessed April 12, 2017, at https://www.eia.gov/petroleum/supply/annual/volume1/archive/2014/psa_volume1_2014.cfm.
- U.S. Energy Information Administration, 2015b, Table 23, percent yield of petroleum products by PAD and refining districts, 2014, in Petroleum supply annual, v. 1: U.S. Energy Information Administration, 1 p., accessed April 12, 2017, at https://www.eia.gov/petroleum/supply/annual/volume1/archive/2014/psa_volume1_2014.cfm.
- U.S. Energy Information Administration, 2016a, Annual coal distribution report 2014, by coal origin State: U.S. Energy Information Administration, 47 p., accessed February 13, 2017, at http://www.eia.gov/coal/distribution/annual/archive/2014/o_14state.pdf.
- U.S. Energy Information Administration, 2016b, Monthly energy review, July 2016: U.S. Energy Information Administration, 224 p., accessed September 22, 2016, at <http://www.eia.gov/totalenergy/data/monthly>.
- U.S. Energy Information Administration, 2016c, Table 5, number of wells producing natural gas by State and the Gulf of Mexico, 2011–2015, in Natural gas annual 2015: U.S. Energy Information Administration, 1 p., accessed April 13, 2017, at <https://www.eia.gov/naturalgas/annual/>.
- U.S. Energy Information Administration, 2017, Appendix C—Full datasheet [—to accompany U.S. Energy Information Administration, The distribution of U.S. oil and natural gas wells by production rate]: U.S. Energy Information Administration, accessed August 14, 2018, at <https://www.eia.gov/petroleum/wells/>.

U.S. Environmental Protection Agency, 2004, Methane emissions from abandoned coal mines in the United States—Emissions inventory methodology and 1990–2002 emissions estimates: U.S. Environmental Protection Agency [report] EPA 430-R-04-001, 54 p. [Also available at <https://nepis.epa.gov/Exe/ZyPDF.cgi/600004JM.PDF?Dockey=600004JM.PDF>.]

U.S. Environmental Protection Agency, 2014, Emission factors for greenhouse gas inventories: Washington, D.C., U.S. Environmental Protection Agency, 5 p., accessed April 4, 2017, at https://www.epa.gov/sites/production/files/2015-07/documents/emission-factors_2014.pdf.

U.S. Environmental Protection Agency, 2015, Inventory of U.S. greenhouse gas emissions and sinks 1990–2013—Revision to offshore platform emissions estimate: Washington, D.C., U.S. Environmental Protection Agency, 3 p., accessed April 5, 2017, at <https://www.epa.gov/sites/production/files/2015-12/documents/revision-offshoreplatforms-emissions-estimate-4-10-2015.pdf>.

U.S. Environmental Protection Agency, 2016a, Annexes to the inventory of U.S. GHG emissions and sinks [—to accompany U.S. Environmental Protection Agency, Inventory of U.S. greenhouse gas emissions and sinks—1990–2014, [report] EPA 430-R-16-002]: U.S. Environmental Protection Agency, 494 p., accessed April 5, 2017, at <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2014>.

U.S. Environmental Protection Agency, 2016b, Inventory of U.S. greenhouse gas emissions and sinks—1990–2014: U.S. Environmental Protection Agency, [report] EPA 430-R-16-002, variously paged, plus additional online data tables, accessed April 5, 2017, at <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks-1990-2014>.

U.S. Environmental Protection Agency, 2017a, Annex 3.5—Methodology for estimating CH₄ and CO₂ emissions from petroleum systems, *in* Natural gas and petroleum systems in the GHG inventory—Additional information on the 1990–2015 GHG inventory (published April 2017) [—to accompany U.S. Environmental Protection Agency, Inventory of U.S. greenhouse gas emissions and sinks—1990–2015, report EPA 430-P-17-001]: U.S. Environmental Protection Agency, 7 tables, accessed February 14, 2018, at <https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systems-ghg-inventory-additional-information-1990-2015-ghg>.

U.S. Environmental Protection Agency, 2017b, Annex 3.6—Methodology for estimating CH₄ and CO₂ emissions from natural gas systems, *in* Natural gas and petroleum systems in the GHG inventory—Additional information on the 1990–2015 GHG inventory (published April 2017) [—to accompany U.S. Environmental Protection Agency, Inventory of U.S. greenhouse gas emissions and sinks—1990–2015, [report] EPA 430-P-17-001]: U.S. Environmental Protection Agency, 11 tables, accessed February 14, 2018, at <https://www.epa.gov/ghgemissions/natural-gas-and-petroleum-systems-ghg-inventory-additional-information-1990-2015-ghg>.

Wilson, D., Billings, R., Chang, R., Enoch, S., Do, B., Perez, H., and Sellers, J., 2017, Year 2014 gulfwide emissions inventory study: Bureau of Ocean Energy Management, OCS study BOEM 2017-044, prepared by Eastern Research Group, Inc. of Morrisville, N.C., 134 p., accessed March 7, 2018, at <https://www.boem.gov/2014-Gulfwide-Emission-Inventory/>.

Wilson, D., Billings, R., Chang, R., Perez, H., and Sellers, J., 2014, Year 2011 gulfwide emissions inventory study: Bureau of Ocean Energy Management, OCS study BOEM 2014-666, prepared by Eastern Research Group, Inc. of Morrisville, N.C., 180 p., accessed March 7, 2018, at <https://www.boem.gov/2011-Gulfwide-Emission-Inventory/>.

World Oil, 2011, US oil wells see slight increase in 2010: World Oil, v. 232, no. 2, 1 p., accessed February 9, 2017, at <https://www.worldoil.com/magazine/2011/february-2011/special-focus/us-oil-wells-see-slight-increase-in-2010>.

World Oil, 2014, Well count for active U.S. oil wells nears 600,000: World Oil, v. 235, no. 2, 1 p., accessed August 14, 2018, at <https://www.worldoil.com/magazine/2014/february-2014/special-focus/well-count-for-active-us-oil-wells-nears-600-000>.

Appendix 2. Detailed Methods: Terrestrial Ecosystems-Associated Carbon Emissions and Sequestration on Federal Lands

Introduction

For this U.S. Geological Survey study, we used a dynamic global vegetation model to estimate net primary productivity (NPP), net ecosystem productivity, and net biome productivity for all Federal land areas in the conterminous United States. Within these areas, we estimated the changes in carbon stocks and fluxes for forests, grasslands, shrublands, wetlands, and agricultural lands resulting from processes associated with deforestation, afforestation, reforestation, agricultural contraction and expansion, urbanization, forest harvest, and wildfire. Historical changes in land use and land cover (LULC) were estimated from a range of remote sensing-based datasets. Carbon dynamics within the dynamic global vegetation model were calibrated on the basis of forest and agricultural inventory data from the U.S. Department of Agriculture (USDA) and remote sensing estimates of NPP.

Integrated Biosphere Simulator Dynamic Global Vegetation Model

For this study, the following LULC changes were considered: logging, deforestation (forest to agriculture conversion), afforestation (agriculture to forest conversion), agriculture contraction (agriculture to grassland conversion), agriculture expansion (grassland to agriculture conversion), and urbanization (forest to urban, grassland to urban, and agriculture to urban conversion). The Integrated Biosphere Simulator (IBIS) models fractional vegetation cover within a single land pixel, which enables the model to run at coarse resolution (1 kilometer [km]) derived from high-resolution LULC products (for example, 30 meters [m]) (Liu and Sleeter, 2018). Most of the land pixels are a mixture of several land-cover types. The IBIS model tracks the percent area of each land-cover type within each land pixel. When an LULC or disturbance event (for example, reforestation, deforestation, or urbanization) occurs, cover fractions are transferred between the relevant land-cover types.

In addition to disturbances detectable through remote sensing methods, less detectable events like forest thinning activities were also considered. The forest thinning rate was calculated using recent annualized forest inventory data (Zhou and others, 2013). Thinning activity was loosely defined as the cutting-related vegetation carbon loss of less than 50 percent during two consecutive observation periods (around 5 years) in order to make the overall thinned-area percentage (that is, 61 percent of the total forest cutting area) in agreement with earlier estimates (Masek and others, 2011; Oswalt and Smith, 2014).

Model calibrations were performed by comparing ecoregion-level NPP, live vegetation, dead vegetation, and crop yield with observations. Observations included remote sensing-derived, 1-km-resolution Moderate Resolution Imaging Spectrometer NPP products for 2001–5 (Zhao and others, 2005), Forest Inventory and Analysis program-derived forest live and dead vegetation growth curves obtained from the Carbon OnLine Estimator (Van Deusen and Heath, 2015), and county-level agricultural data (U.S. Department of Agriculture, 2011). During calibration, NPP and grain-yield scalars were generated on the basis of differences between IBIS outputs and observations. The scalars were then used to modify the maximum Rubisco-limited rate of carboxylation (Vmax) of related plant functional types (forest or crop) in a new IBIS run. For the forest live and dead vegetation calibration, 100 years of growth of live and dead vegetation from IBIS simulation were compared with the Carbon OnLine Estimator data. Scalars were generated to modify the tree mortality rate and the transfer rate of deadwood to ground litter.

Data Sources

Input data related to land cover include (1) 30-m vegetation-cover type and vegetation-height information from the USDA–U.S. Department of the Interior LANDFIRE program (Rollins, 2008), (2) five dates of 60-m resolution land-cover-type information from the U.S. Geological Survey (USGS) Land Cover Trends project (Loveland and others, 2002; Sleeter and others, 2013), (3) 30-m resolution annual wildland fire scar and burn severity information from the USGS–USDA Monitoring Trends in Burn Severity project (Eidenshink and others, 2007), and (4) freshwater and saline water wetland-fraction map derived from 30-m USGS National Land Cover Database and National Oceanic and Atmospheric Administration Coastal Change Analysis Program data (Homer and others, 2007). All land-cover maps were aggregated to a consistent 960-m resolution in this study. In addition, regional rates of forest stand thinning were derived from previous studies (Law and others, 2012; Zhou and others, 2013). We used Parameter-elevation Regression on Independent Slopes Model 4-km resolution monthly precipitation and temperature data from 1971 to 2010 as the main climate drivers (Daly and others, 2008). Other climate variables, such as relative humidity and wind speed, were monthly normals for 1961–90. The Soil Survey Geographic Database (Natural Resources Conservation Service, 2009) soil carbon content was used to initialize soil condition. For the period 2011–15, no changes in LULC were modeled owing to a lack of spatially explicit data. However, fire and climate data were available and were used in the model simulations.

References Cited

- Daly, C., Halbleib, M., Smith, J.I., Gibson, W.P., Doggett, M.K., Taylor, G.H., Curtis, J., and Pasteris, P.P., 2008, Physiographically sensitive mapping of climatological temperature and precipitation across the conterminous United States: International Journal of Climatology, v. 28, no. 15, p. 2031–2064. [Also available at <https://doi.org/10.1002/joc.1688>.]
- Eidenshink, J., Schwind, B., Brewer, K., Zhu, Z.-L., Quayle, B., and Howard, S., 2007, A project for monitoring trends in burn severity: Fire Ecology, v. 3, no. 1, p. 3–21. [Also available at <https://doi.org/10.4996/fireecology.0301003>.]
- Homer, C.G., Deqitz, J., Fry, J., Coan, M., Hossain, N., Larson, C., Herold, N., McKerrow, A., VanDriel, J.N., and Wickham, J., 2007, Completion of the 2001 National Land Cover Database for the conterminous United States: Photogrammetric Engineering & Remote Sensing, v. 73, no. 4, p. 337–341.
- Law, B.E., Hudiburg, T.W., and Luyssaert, S., 2012, Thinning effects on forest productivity—Consequences of preserving old forests and mitigating impacts of fire and drought: Plant Ecology & Diversity, v. 6, no 1., p. 73–85. [Also available at <https://doi.org/10.1080/17550874.2012.679013>.]
- Liu, J., and Sleeter, B.M., 2018, Simulated 1km resolution 1971–2015 ecosystem carbon variables from the IBIS model (2017/09/12): U.S. Geological Survey data release, accessed October 2, 2018, at <https://doi.org/10.5066/P9CQPG86>.
- Loveland, T.R., Sohl, T.L., Stehman, S.V., Gallant, A.L., Sayler, K.L., and Napton, D.E., 2002, A strategy for estimating the rates of recent United States land-cover changes: Photogrammetric Engineering & Remote Sensing, v. 68, no. 10, p. 1091–1099.
- Masek, J.G., Cohen, W.B., Leckie, D., Wulder, M.A., Vargas, R., de Jong, B., Healey, S., Law, B., Birdsey, R., Houghton, R.A., Mildrexler, D., Goward, S., and Smith, W.B., 2011, Recent rates of forest harvest and conversion in North America: Journal of Geophysical Research, v. 116, no. G4, 22 p. [Also available at <https://doi.org/10.1029/2010JG001471>.]
- Natural Resources Conservation Service, 2009, Soil Survey Geographic (SSURGO) Database: Natural Resources Conservation Service database, accessed November 20, 2015, at <https://gdg.sc.egov.usda.gov/>.
- Oswalt, S.N., and Smith, W.B., eds., 2014, U.S. forest resource facts and historical trends: U.S. Forest Service [report] FS-1035, 62 p. [Also available at https://www.fia.fs.fed.us/library/brochures/docs/2012/ForestFacts_1952-2012_Metric.pdf.]
- Rollins, M.G., 2008, LANDFIRE—A nationally consistent vegetation, wildland fire, and fuel assessment: International Journal of Wildland Fire, v. 18, no. 3, p. 235–249, accessed October 1, 2010, at <https://doi.org/10.1071/WF08088>.]
- Sleeter, B.M., Sohl, T.L., Loveland, T.R., Auch, R.F., Acevedo, W., Drummond, M.A., Sayler, K.L., and Stehman, S.V., 2013, Land-cover change in the conterminous United States from 1973 to 2000: Global Environmental Change, v. 23, no. 4, p. 733–748. [Also available at <https://doi.org/10.1016/j.gloenvcha.2013.03.006>.]
- U.S. Department of Agriculture, 2011, QuickStats, U.S. Department of Agriculture web page, accessed August 2011, at <https://quickstats.nass.usda.gov/>.
- Van Deusen, P., and Heath, L.S., 2015, COLE web applications suite, version 2.0: National Council for Air and Stream Improvement and U.S. Forest Service, accessed November 23, 2015, at <http://www.ncasi2.org/COLE/>.
- Zhao, M., Heinrich, F.A., Nemani, R.R., and Running, S.W., 2005, Improvements of the MODIS terrestrial gross and net primary production global data set: Remote Sensing of Environment, v. 95, no. 2, p. 164–176. [Also available at <https://doi.org/10.1016/j.rse.2004.12.011>.]
- Zhou, D., Liu, S., Oeding, J., and Zhao, S., 2013, Forest cutting and impacts on carbon in the eastern United States: Scientific Reports, v. 3, 7 p. [Also available at <https://doi.org/10.1038/srep03547>.]

For more information about this publication, contact
Director, Eastern Energy Resources Science Center
U.S. Geological Survey
956 National Center
12201 Sunrise Valley Drive
Reston, VA 20192

For additional information visit <https://energy.usgs.gov/GeneralInfo/ScienceCenters/Eastern.aspx>

Publishing support provided by the Reston Publishing Service Center

Exhibit 5

	District Court Order Denying Motion to Dismiss November 10, 2016	9th Circuit Order Denying Mandamus March 7, 2018	9th Circuit Order Denying Mandamus July 20, 2018	District Court Order Denying Summary Judgment October 15, 2018
Plaintiffs' Art. III Standing	X	X	X	X
Stable Climate Right	X	X	X	X
Public Trust Doctrine	X	X	X	X
Separation of Powers	X	X	X	X
5th Amendment Provides Claim Separate From APA			X	X

Exhibit 6

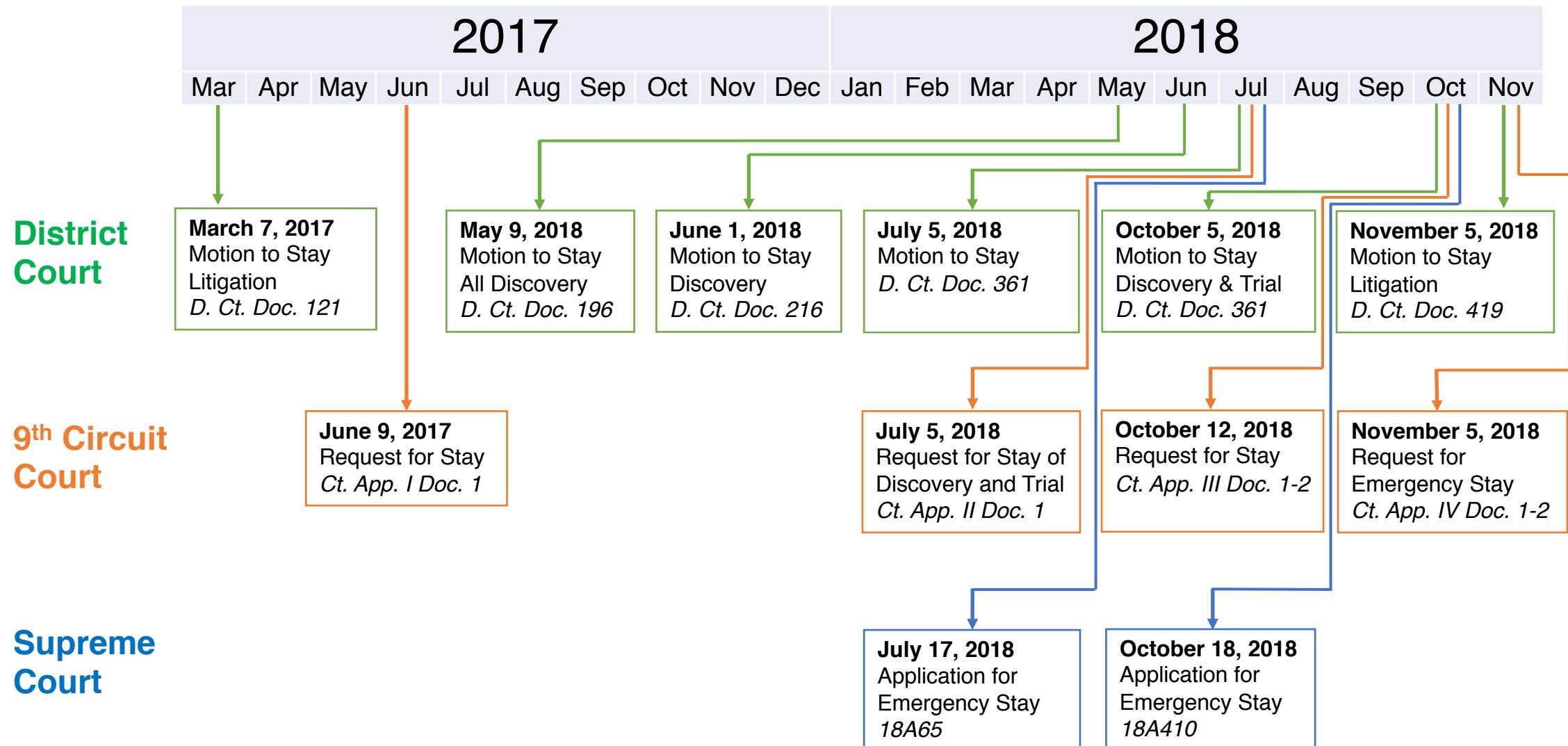
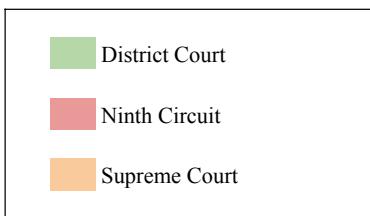


Exhibit 7



Case No. 18-73014

**IN THE UNITED STATES COURT OF APPEALS
FOR THE NINTH CIRCUIT**

KELSEY CASCADIA ROSE JULIANA, *et al.*,
Plaintiffs-Appellees,
v.
UNITED STATES OF AMERICA, *et al.*,
Defendants-Appellants.

On Petition For Permission to Appeal from the United States District Court for the
District of Oregon (No. 6:15-cv-01517-AA)

**DECLARATION OF AJI P. IN SUPPORT OF PLAINTIFFS' EMERGENCY
MOTION UNDER CIRCUIT RULE 27-3 TO LIFT STAY IN CASE NO. 18-
73014, OR, ALTERNATIVELY, EXPEDITE REVIEW OF PETITIONS
FOR WRIT OF MANDAMUS (18-73014) AND PERMISSION FOR
INTERLOCUTORY APPEAL (18-80176)**

JULIA A. OLSON
(OSB No. 062230, CSB No. 192642)
Wild Earth Advocates
1216 Lincoln St.
Eugene, OR 97401
Tel: (415) 786-4825

PHILIP L. GREGORY
(CSB No. 95217)
Gregory Law Group
1250 Godetia Drive
Redwood City, CA 94062
Tel: (650) 278-2957

ANDREA K. RODGERS
(OSB No. 041029)
Law Offices of Andrea K. Rodgers
3026 NW Esplanade
Seattle, WA 98117
Tel: (206) 696-2851

*Attorneys for Plaintiffs-Appellees
and Real Parties in Interest*

I, Aji P., hereby declare and if called upon would testify as follows:

1. I am a plaintiff in the above-entitled action. I make this Declaration in support of Plaintiffs' emergency motion to have this Court lift the stay that has stopped us from going to trial in our case, a trial that was supposed to start on October 29, 2018. I have personal knowledge of the facts I state herein and I would testify to these facts if I were asked to do so under oath in court.
2. I opened up my entire schedule this fall in order to attend my trial and be available to testify and to watch our experts and defendants' experts testify. I did not get a job this fall because I was making a ten-week commitment to not be in Seattle, where I live, and to attend trial in Eugene, Oregon.
3. I also held off on completing my high school degree because I was preparing to come to Eugene. This case, and what it means to me, what it means for the health and safety of my life, my co-plaintiffs' lives, and the future of children everywhere, is the most important thing I am doing right now and I wanted to devote my time and attention to helping us succeed.
4. If we had started the trial on October 29, the trial would be done by now. Instead, our case is in limbo and no court has told us why our trial has been stayed. I watch this happen and it seems that my government is not following the rules.

5. The feeling I have inside of me is a horrible feeling. There was no trial, so there is no remedy in sight for our climate emergency. I would describe it as the lead up to complete despair. I try not to call it despair yet, because that means I've lost all hope, but it is close to that feeling. I am in the lead up to despair where every moment I am watching the clock run out. Time is actually slipping away from us.
6. Every day I feel more pressure to successfully address this climate crisis. Sometimes every hour of every day feels like there is more pressure building. I have been waiting for three years to get the climate science evidence and our stories into court, to have our case heard, and to start the process of healing our climate. All the while the clock has been ticking and the pressure has been building.
7. My motivation to find a job is low at the moment because I am trying to find a job that will be flexible enough so that I can be at my trial whenever that will happen and there is no certainty that we will ever get to trial, that our rights will ever be heard in court, that we will ever get the protection and remedy we need. It feels like whiplash. The unending stays of our case feel like constantly being slapped back in your seat. It is not only intensely frustrating, but worsens the pressure cooker feeling I have.

8. I have these moments where I feel the weight of all of it bearing down on me; the weight of climate change, the weight of the efforts I make to try to change the course of our fate, the weight of the judicial system not fairly responding to our urgent claims when all of the evidence shows we are already in danger and the danger mounts daily. I can relate this feeling to a big project that has a deadline. If I have a short amount of time to complete something and there is still a lot to do, and the seconds tick by and I get closer to the deadline, but the project isn't making progress, there is this feeling of approaching panic. At first, I will have the feeling that I can do this, it will be okay, and then it moves to the feeling that we are going to fail—it will be too late. I regularly feel that panic now.

9. The intense stress of living with climate change and my government's conduct to make it worse, and the courts repeatedly stopping our trial has significant effects on my life. While attending my public high school I suffered from depression trying to balance my activist efforts to work on stopping climate change, to attend school where we rarely discussed climate change, and living with the effects of climate change in my life. The anxiety causes stress-induced insomnia where I have periods of my life when I cannot sleep for days on end.

10. I am very involved with tracking the effects further fossil fuel emissions are having on our climate. At the same time my government is promoting fossil fuels, our political leaders blatantly misrepresent the facts about climate change denying the truth of government reports. In our trial, we planned to introduce evidence about how severe the current situation is so that the courts could start the process of protecting the rights and future of young Americans like me.

11. I have read some parts of the new climate reports from this fall and talked with people about them. They keep confirming what we know and they keep making more dire projections about my future. At the same time, my government doesn't stop doing what it is doing to make my life unsafe. I can't watch or track the things Defendants are doing anymore to keep our country powered by fossil fuels because every decision makes me feel so much anger. It increases the pressure cooker feeling that lives in me and ignites my feelings of panic.

12. The only way I can alleviate these feelings is to make forward progress. The fact that we were almost to our trial was such a moment of hope and relief. The fact that we are moving backward, away from the remedy we need to protect our lives, lays more pressure on me and shortens the time we have left.

13. I make this declaration to inform this Court about how profoundly its decision to stop our trial is having in my life, and I know the lives of my co-plaintiffs. We didn't even get a reason for that decision that explains why the government is being protected from having to go to trial, when I live every day with the emotional and psychological stress, bordering on despair, of ongoing climate danger and destruction that my government keeps making worse. There is no explanation from the courts about why our trial is stayed, but the government conduct that is causing people to lose their homes, their lives, their health and their safety and wellbeing can continue. I am being harmed. My government is knowingly causing it. My courts are not protecting me or even giving me the chance to tell my story at trial and to put on the testimony of our experts, and to prove our case. All we are asking is for the courts to let us have our trial and try to get a remedy that will slow the pressure cooker and give us a fighting chance to protect ourselves and children everywhere.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct. Executed on December 20, 2018.

/s Aji P.
Aji P.