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THE TAR SANDS TANKER THREAT: AMERICAN WATERWAYS IN INDUSTRY'S SIGHTS

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About NRDC

The Natural Resources Defense Council is an international nonprofit environmental organization with more than 2.4 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, San Francisco, Chicago, Montana, and Beijing. Visit us at nrdc.org.

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Corals in the Florida Keys National Marine Sanctuary.

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The Maine Coast near Acadia National Park.

Executive Summary

Following President Obama's rejection of TransCanada's proposed Keystone XL pipeline in 2015, Canadian oil producers have looked for new ways to get their tar sands crude oil to the United States. Their latest idea? Move tar sands oil by tankers on America's rivers and off its coasts. Four new pipeline and rail proposals—as well as existing infrastructure on the Mississippi River—are now being pursued by the industry as alternative means to transport their hazardous, dirty oil. Each proposal entails loading oil tankers and barges—hundreds every year—with tar sands crude and then moving them down U.S. coastlines and rivers to reach heavy oil refineries on the Gulf coast and in California.

If all of these proposals are approved, the number of tankers and barges carrying tar sands crude off the U.S. coasts and on U.S. rivers would skyrocket from around 80 per year today to more than 1,085 per year as early as 2021. That's more than a 12-fold increase. In their wake, the entire Pacific and Atlantic coastlines—including the Salish Sea, San Francisco Bay, Gulf of Maine, Chesapeake Bay, and Florida Keys—would be at risk of costly and possibly irreparable tar sands oil spills. Major American rivers like the Hudson, Mississippi, and Columbia would not be spared from this new threat either.

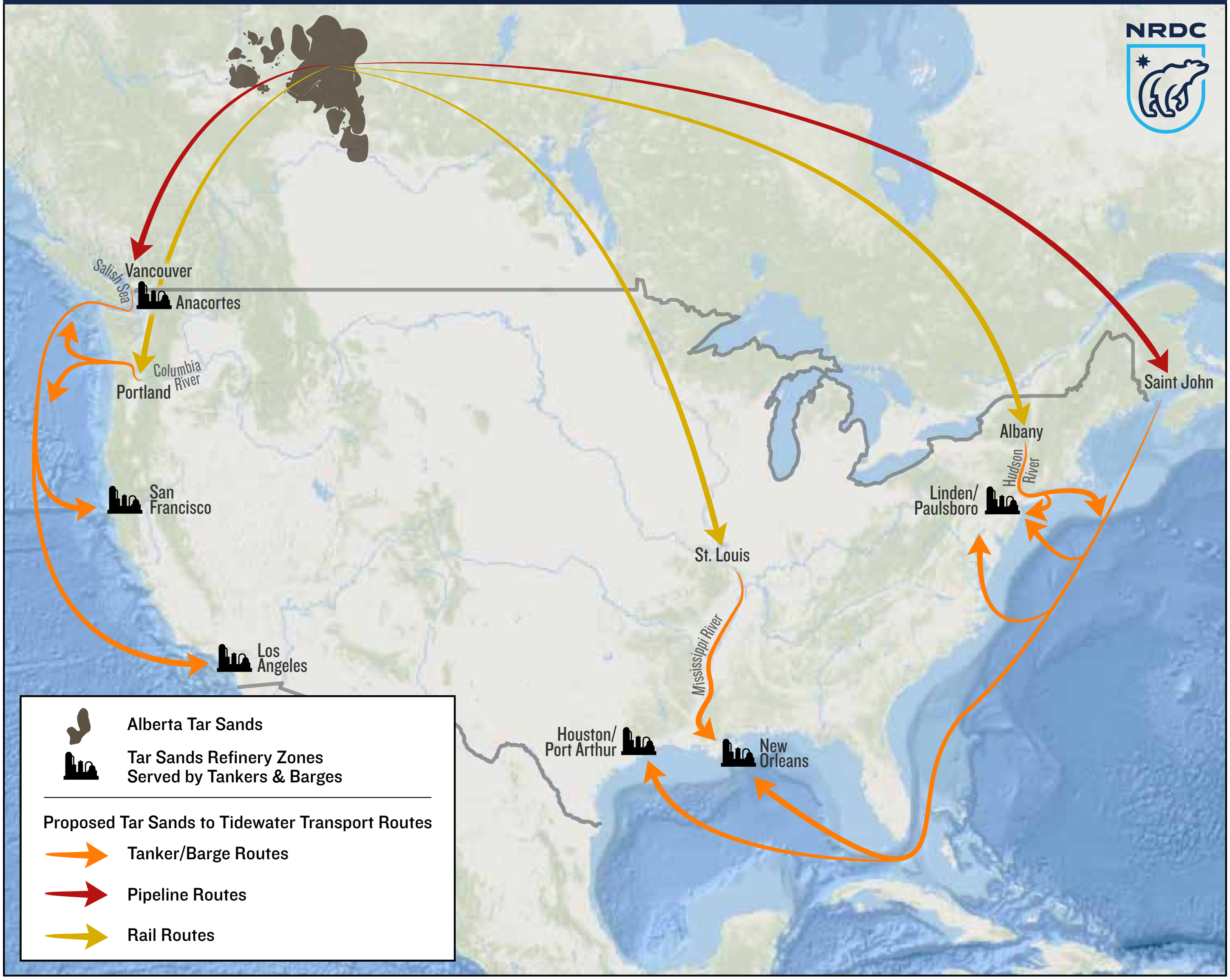
While any oil tanker spill poses risks to the receiving waters, the unique properties of tar sands oil makes any major increase in tanker numbers particularly concerning. This is because most tar sands crude oil is more dense and sticky than other oils moved by tanker, and after a spill, it rapidly loses its ability to float, introducing contaminants that persist in the environment for many years. A February 2016 study by the National Academy of Sciences found that tar sands crude is so dramatically different from other crude that neither government nor private spill responders have the tools or technologies that could effectively clean up this heavy, toxic oil in the event of a spill. Thus, by pursuing shipment via ocean and river, the Canadian tar sands industry places sensitive marine and freshwater resources in Canada and the United States—as well as major economic sectors dependent on healthy oceans and rivers—at severe risk of long-term damage.

And if this weren't enough, our global climate would also pay a heavy price. Tar sands oil is one of the most carbon-intensive fuels in the world, and its production destroys vast areas of Canada's boreal forest—a carbon storehouse that plays a crucial role in moderating the global climate. Taken together, the tar sands industry projects described in this paper would produce at least 362 million metric tons of global carbon dioxide emissions each year. This is equivalent to the annual emissions of 105 coal-fired power plants or more than 76 million passenger vehicles.

The scale of the tar sands tanker threat requires immediate action. The best available science says that we are far from prepared to respond effectively to a waterborne tar sands oil spill. This lack of preparedness could lead to devastating consequences for our marine and riverine resources and the communities that depend on them. If we cannot respond to a tar sands spill, the government should take action to ensure vessels carrying tar sands oil do not enter U.S. waters.

Therefore, NRDC urges government at all levels—local, state, and federal agencies responsible for planning and executing spill responses—to take preventive action to protect the environment, public safety, and our coastal communities. These communities rely on multibillion-dollar tourism and commercial fishing interests, clean shorelines, and healthy ecosystems for their vitality and economic stability. In the meantime, we must continue to make progress in decreasing demand for tar sands oil—and fossil fuels in general—thereby decreasing and eliminating the risks presented to water, climate, and public health and safety.

FIGURE 1: ARROWS ILLUSTRATE THE APPROXIMATE DIRECTION OF NEWLY PROPOSED TAR SANDS TRANSPORTATION ROUTES



I. The Latest Scheme: Pipelines Loading Tar Sands Oil into Tankers

To understand the threat of tankers to the American coasts, one must understand the industry's dogged efforts to move tar sands products out of landlocked Alberta. Prior to the explosion of the tar sands industry over the past 20 years, pipelines designed to carry conventional oil between Canada and the United States were already in place, giving Canadian producers most of today's export capacity of 2.5 million barrels per day (bpd).[1]

Planned tar sands expansion has been cut back significantly in recent years due to the rejection of Keystone XL, other transport constraints, and low global oil prices. Yet Alberta's tar sands industry has continued to increase production and could fill most of its pipelines by the end of 2017.[2,3] Because building new pipelines across the U.S.–Canada border over land has proved contentious due to local, regional, and national opposition, producers are looking to the Canadian coasts for an alternative route.

1 McKinnon, H., G. Muttitt, and L. Stockman, "Lockdown: The End of Growth in the Tar Sands," Oil Change International, October 2015, p. 1, http://priceofoil.org/content/uploads/2015/10/Lockdown_Final.pdf.

2 The Canadian Association of Petroleum Producers (hereinafter CAPP), "Crude Oil: Forecast, Markets and Transportation," June 2016, p. 4, Fig. 2.1, http://www.capp.ca/publications-and-statistics/publications/284950.

3 McKinnon, H., G. Muttitt, and L. Stockman, "Lockdown" at p. 21, Fig. 7.

Proposed pipelines to Canada's east and west coasts (where tar sands crude would be loaded onto tankers) would give the tar sands industry at least 1.5 million bpd of new transport capacity.[4] This could increase Canadian tar sands exports to the United States by up to 60 percent. Additional proposals for large rail facilities on the banks of major U.S. rivers would give the industry further access to Atlantic, Pacific, and Gulf coast shipping routes.[5] Once the oil reaches tankers, the tar sands industry could take advantage of one of the cheapest means of moving oil available,[6] gaining relatively easy and inexpensive access to the majority of the world's heavy crude refining capacity, located on the U.S. Gulf and California coasts.[7]

WHAT IS TAR SANDS CRUDE OIL?

Tar sands crude oil is extra-heavy, low-grade oil found predominantly in sedimentary deposits beneath the boreal forest of northern Alberta.[8] Unlike conventional oils, tar sands occur as "bituminous sand," which is a mixture of sand, water, clay, and bitumen that is strip-mined or steamed from the ground.[9] At room temperature, the crude oil portion of tar sands—known as natural bitumen—has the consistency of peanut butter and must be heavily processed during both production and refining to be transformed into a useful petroleum product.[10] Oils originating in the tar sands are known to be some of the world's most carbon-intensive, due to the large amounts of energy needed to extract and refine natural bitumen into a variety of fuels.[11]

Today, several types of tar sands products are transported to U.S. markets, predominantly by pipeline.[12] Most tar sands crude produced today—as well as most projected future production—is moved as diluted bitumen, or "dilbit."[13] Dilbit is a manufactured combination of heavy raw bitumen and light diluents, typically made up of natural gas liquid condensates.[14] Synthetic oil is the second most common tar sands product, representing 25 percent of current production. It is a partially refined form of tar sands crude that behaves more like conventional oil and does not require additives to be moved.[15] Despite these "advantages" over dilbit, synthetic oils are among the most costly and carbon-intensive oils in production.[16]

4 Kinder Morgan's Trans Mountain expansion would add 590,000 bpd of new capacity for Canadian oil producers, while TransCanada's Energy East would add 1.1 million bpd. Trans Mountain, "Proposed Expansion," accessed October 13, 2016, https://www.transmountain.com/proposed-expansion. TransCanada: Energy East Pipeline, "The Project," accessed October 13, 2016, http://www.energyeastpipeline.com/about-2/the-project/. Because close to 200,000 bpd of Energy East capacity may be committed to Bakken producers in Saskatchewan and North Dakota, we assume that these pipelines give Alberta producers around 1.5 million bpd of new capacity. Axelrod, J., M. Beer, and A. Swift, "Tar Sands in the Atlantic Ocean: TransCanada's Proposed Energy East Pipeline," Natural Resources Defense Council (hereinafter NRDC), July 2016, p. 1, https://www.nrdc.org/sites/default/files/transcanada-energy-east-pipeline-report.pdf.

5 *See generally:* Tesoro Savage, Application for Site Certification Agreement, No. 2013-01, Vol. 1, Cover Letter, August 29, 2013, http://www.efsec.wa.gov/Tesoro%20Savage/Application/EFSEC%202013-01%20Volume%20I/EFSEC%202013-01%20-%20Compiled%20PDF%20Volume%20I.pdf. Brower, N., "Re: Global Companies LLC—Albany, NY Terminal— Title V Facility Permit No. 4-0101-00112/00029," received by Donald Welsted, Envirospec, November 8, 2013, http://www.dec.ny.gov/docs/permits_ej_operations_pdf/globalrevisedpermitap2013.pdf.

6 *Compare* Frittelli, J., et al., "U.S. Rail Transportation of Crude Oil: Background and Issues for Congress," Congressional Research Service, December 4, 2014, p. 7, https://www.fas.org/sgp/crs/misc/R43390.pdf, *with* Frittelli, J., "Shipping U.S. Crude Oil by Water: Vessel Flag Requirements and Safety Issues," Congressional Research Service, July 21, 2014, p. 10, https://www.fas.org/sgp/crs/misc/R43653.pdf. These show that transport cost per barrel is highest for rail and can be equivalent for pipeline and tanker (though tanker costs can be significantly lower than other modes).

7 "2016 Worldwide Refining Survey," *Oil and Gas Journal*, December 2015, http://ogjresearch.stores.yahoo.net/worldwide-refinery-survey.html (subscription only). Asia is often mentioned as the destination for tar sands crude moved by Kinder Morgan's Trans Mountain pipeline. However, a long list of factors suggests that this is baseless misdirection. These factors include a lack of open heavy oil refining capacity, long-term supply contracts with Russian producers, debt payments made in the form of heavy crude oil from Venezuela, and aggressive pricing by Saudi Arabian producers. Agnihotri, G., "What Does the Latest Possible China–Russia Oil Deal Mean to the Global Energy Market?" Seeking Alpha, May 10, 2016, http://seekingalpha.com/article/3973769-latest-possible-china-russia-oil-deal-mean-global-energy-market. Ulmer, A. and C. Pons, "Venezuela Says Better Oil Loans Deal Reached with China," *Reuters*, May 16, 2016, http://www.reuters.com/article/us-venezuela-economy-idUSKCN0Y71VB; Wilkin, S., "Saudi Arabia Cuts Oil Price to Asia as Iran Battle Heats Up," *Bloomberg,* July 31, 2016, http://www.bloomberg.com/news/articles/2016-07-31/saudis-lower-oil-price-to-asia-most-in-10-months-in-sign-of-glut. Meanwhile, declining California heavy oil production means that its refineries have the ability to take increasing volumes of heavy oil from new sources. NRDC, "West Coast Tar Sands Invasion," April 2015, p. 3, https://www.nrdc.org/sites/default/files/west-coast-tar-sands-threat-report.pdf.

8 Alberta Energy, "Oil Sands Projects," accessed October 13, 2016, http://www.energy.alberta.ca/LandAccess/pdfs/OilSands_Projects.pdf.

9 CAPP, "What Are Oil Sands?" accessed October 13, 2016, http://www.capp.ca/canadian-oil-and-natural-gas/oil-sands/what-are-oil-sands.

10 Ibid.

11 *Compare* Oil-Climate Index, "Viewing Total Emissions," accessed October 13, 2016, http://oci.carnegieendowment.org/#total-emissions, *with* Oil-Climate Index, "Canada Cold Lake CSS Dilbit," accessed October 13, 2016, http://oci.carnegieendowment.org/#oil/canada-cold-lake-css-dilbit, *and* Oil-Climate Index, "Canada Athabasca DC SCO," accessed October 13, 2016, http://oci.carnegieendowment.org/#oil/canada-athabasca-dc-sco. These represent examples of oils at the median and at the maximum end of the emissions spectrum of Canada's oil production.

12 These products include raw bitumen (rawbit), diluted bitumen (known as dilbit, railbit, or synbit, depending on its formulation), and synthetic oil (SCO). In the pipeline and rail context, most tar sands oil is moved as dilbit, railbit, and SCO. Tar sands dilbit and railbit are typically moved as a combination of 70–80% bitumen and 20–30% natural gas liquid condensates, with ratios varying according to mode of transportation and season. More diluent is needed to allow diluted bitumen to flow in pipelines and during winter; less is needed in rail cars and during summer. Fielden, S., "Railbit Train to Natchez—First Unit Railbit Train from Western Canada to the Eastern Gulf," RBN Energy LLC, April 1, 2014, https://rbnenergy.com/railbit-train-to-natchez-first-unit-railbit-train-from-western-canada-to-the-eastern-gulf.

13 Currently just over 25% of tar sands production is upgraded into SCO, with future growth expected to remain relatively flat through 2030. CAPP, "Crude Oil," at Appendix B.2.

14 "Natural gas liquid condensates" can refer to several different substances. In this instance, it refers to a manufactured blend of hydrocarbons occurring in the C5-C6 range with an API gravity typically ranging from 50 degrees to 70 degrees. The blend also has added benzene, toluene, ethyl benzene, and xylene—all of which are highly volatile and toxic. These liquids are sometimes referred to as Pentane Plus. Transparency Market Research, "Pentane Plus Market: Global Industry Analysis, Market Size, Share, Growth, Trends and Forecast 2014–2020," accessed October 13, 2016, http://www.transparencymarketresearch.com/pentane-plus-market.html.

15 Petropedia, "Synthetic Crude Oil (SCO)," accessed October 13, 2016, https://www.petropedia.com/definition/28/synthetic-crude-oil-sco. CAPP, "Crude Oil," at Appendix B.2. By 2030, synthetic oil production is expected to grow modestly, but it will make up only 18% of tar sands production if industry projections hold.

16 Oil-Climate Index, "Viewing Total Emissions," (see Canada Athabasca DC SCO).

A. OVERVIEW: TAR SANDS TANKERS ON U.S. WATERS

Today, very little tar sands crude moves on U.S. waterways, with one exception: The Trans Mountain pipeline brings Alberta tar sands to an export terminal near Vancouver, British Columbia. In the past, this terminal has loaded up to 60 tankers and 20 barges per year (carrying roughly one-third of the pipeline's 300,000 bpd capacity) with tar sands crude.[17] The 20 barges currently move 2.4 million barrels of oil per year to the U.S. Oil refinery in Tacoma, Washington; the rest travels by tanker to California refineries that are able to process extra-heavy crude oils.[18]

However, if the pipeline and rail infrastructure project proposals discussed below were to move forward, a very different picture would emerge: Some 281 new loaded tankers and at least 410 barges would travel on the Hudson River and off the Atlantic and Gulf coasts, with up to 405 of these 691 vessels loaded with tar sands crude.[19] At the same time, as many as 348 new loaded tankers and 365 new loaded barges would travel on the Columbia River, through the Salish Sea, and along the Pacific coast, with up to 470 of these 713 vessels loaded with tar sands.[20] An additional 130 new loaded barges could carry tar sands crude on the Mississippi River if oil prices were to recover.[21] This amounts to an average of three new oil tankers or barges—ranging in capacity from 100,000 to 1.9 million barrels—traveling on U.S. waters every single day.

TABLE 1: SUMMARY OF VESSEL NUMBERS ASSOCIATED WITH PROPOSED PIPELINE AND RAIL PROJECTS

PROJECT	TOTAL OIL VESSELS LOADED	*TAR SANDS* VESSELS LOADED	NEW OIL VESSELS LOADED	*NEW TAR SANDS* VESSELS
Energy East	281	281	281	281
Trans Mountain Expansion	428	428	348	348
Tesoro-Savage	365	122	365	122
Hudson Terminals	410	124	0	124
Mississippi Terminals	130+	130	130+	130
Totals	**1,614+**	**1,085**	**1,124+**	**1,005**

17 Trans Mountain, "Trans Mountain Expansion Project Community Workshop," April–June 2013, p. 8, https://www.transmountain.com/uploads/papers/1383856247-13-04-19-phase-3-community-workshop-edson.pdf.

18 Felleman, F., "Tar Sands/Dilbit Crude Oil Movements Within the Salish Sea," Friends of the Earth, April 2016, http://webiva-downton.s3.amazonaws.com/877/22/b/7886/1/Tar_Sands_Report.pdf.

19 TransCanada Pipeline Limited, Energy East Pipeline, Consolidated Application, Vol. 1, Section 1: Executive Summary, submitted to the Canada National Energy Board (hereinafter NEB), May 2016, docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/2432218/2540913/2543426/2957695/A76905-3_V1_Sec1_Executive_Summary_-_A5A0G6.pdf?nodeid=2957481&vernum=-2. The numbers for the Hudson River are estimated on the basis of reporting that found one barge loaded by Global Partners every day and one tanker loaded by Buckeye Partners every eight days. Vieira, A., "U.S. Barge Operators Transport Domestic Crude on Inland Rivers," *Professional Mariner*, December 5, 2014, http://www.professionalmariner.com/December-January-2015/US-barge-operators-transport-domestic-crude-on-inland-rivers.

20 Trans Mountain, "Trans Mountain Expansion Project Community Workshop" at p. 8. Tesoro Savage, Application for Site Certification Agreement, at pp. 1-16.

21 Cooper, D., "Rail's New Oil Rush: Calgary Firm Will Ship via CN to U.S," Insightwest, November 10, 2012, http://www.insightwest.ca/news/oil-insight/rails-new-oil-rush-calgary-firm-will-ship-via-cn-to-u-s/. O'Meara, D., "Barges Shine in Summer of Alternatives as Oil Producers Grow Antsy," *Financial Post*, August 31, 2013, http://business.financialpost.com/news/energy/barges-shine-in-the-summer-of-alternatives?___lsa=66a4-d98d.

CLIMATE IMPACTS

Tar sands production carries three major climate implications. First, the amount of energy required to produce a barrel of tar sands crude is significantly higher than what is required for almost any other oil. This energy is often generated via burning natural gas, making tar sands production 17 percent more carbon-intensive than production of other oils.[22] Second, production timelines for tar sands projects are extremely long, due to the large amount of oil producers can recover with careful site selection and preparation. The operating life of a tar sands project can be up to 50 years versus the 3 to 5 years of peak production for many conventional oil wells.[23] Third, tar sands production projects require huge amounts of up-front capital investment, meaning that once they are built, producers can't afford to shutter them. This means that tar sands production gets locked into the global energy mix for many years once it comes online, regardless of changes in global climate and energy policy. This creates major barriers for meaningful shifts away from high-carbon sources in our energy consumption unless the industry voluntarily shutters operations and absorbs the associated losses.

Production of an additional 1.5 million barrels of tar sands crude per day would have a substantial impact on our shared climate. Based on estimates of life-cycle emissions of the types of crudes produced and transported in Canada, the industry's expansion plans would result in 362 million metric tons of global carbon dioxide emissions each year.[24] This is equivalent to the annual emissions of 105 coal-fired power plants.[25]

ENVIRONMENTAL IMPACTS

Tar sands oil is one of the world's most environmentally harmful types of oil for many reasons, including its location under Canada's sensitive boreal forest, its toxicity, the excessive amounts of water used during production, its negative climate impact, and the release of toxic refinery by-products. To get tar sands oil out of the ground, areas must be strip-mined, or superheated steam must be pumped deep underground, melting the thick bitumen and allowing it to flow into well bores from which it is pumped to the surface.[26,27] In both cases, the boreal forest that sits above the oil pays the price. Where tar sands are strip-mined, the forest and its bogs are cleared and drained. Where tar sands are steamed and pumped, the forest is fragmented by endlessly crisscrossing seismic lines, roads, and buried pipes. This destruction of the boreal releases stored carbon, contributing to climate change. Moreover, it is leading to the localized extinction of once-plentiful caribou herds and the deaths of thousands of migratory songbirds.[28]

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Clearcutting and open pit mining are destroying vast stretches of Canada's boreal forest in Alberta.

22 Lattanzio, R.K., "Canadian Oil Sands: Life-Cycle Assessments of Greenhouse Gas Emissions," Congressional Research Service, March 10, 2014, p. 2 and p. 9, https://www.fas.org/sgp/crs/misc/R42537.pdf.

23 *Compare* U.S. Energy Information Administration, "New Eagle Ford Wells Continue to Show Higher Production," September 29, 2014, http://www.eia.gov/todayinenergy/detail.cfm?id=18171, *with* Imperial Oil Resources, "Aspen: A SAGD Development," June 2014, p. 1, https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2449925/2451875/2883205/C363-37-10_-_Attachment_6_to_Response_to_National_Energy_Board_IRs_%2800286109xC6E53%29_-_A4W4V2.pdf?nodeid=2882515&vernum=-2.

24 This number is based on the Carnegie Endowment report "Assessing Global Oils." We used the life cycle emission estimates for Canada Cold Lake dilbit. Because proposed pipelines are expected to carry a range of tar sands products—from carbon-intensive Canada Heavy Sour SCO to a range of dilbits—as well as small quantities of lighter oils (which generally have lower carbon intensities), we feel that Canada Cold Lake dilbit represents a relatively conservative baseline for estimating annual life-cycle emissions attributable to the proposed project. Oil-Climate Index, "Profiling Emissions in the Supply Chain," accessed October 14, 2016, http://oci.carnegieendowment.org/?#supply-chain.

25 EPA, "Greenhouse Gas Equivalencies Calculator," May 2016, https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator.

26 "Process Overview: Extracting Oil from the Oil Sands," *Oil Sands Magazine*, January 20, 2016, http://www.oilsandsmagazine.com/oil-sands-basics-bitumen-production-process-overview.

27 Ibid.

28 Dawson, C., "Caribou Population Shrinking in Canada's Oil Sands," *The Wall Street Journal,* June 17, 2014, http://www.wsj.com/articles/caribou-population-shrinking-in-canadas-oil-sands-1403022042. Wells, J., "Danger in the Nursery: Impact on Birds of Tar Sands Oil Development in Canada's Boreal Forest," NRDC, December 2008, https://www.nrdc.org/sites/default/files/fborealbirds.pdf. Carlson, M., J. Wells, and D. Roberts, "The Carbon the World Forgot: Conserving the Capacity of Canada's Boreal Forest Region to Mitigate and Adapt to Climate Change," Boreal Songbird Initiative and Canadian Boreal Initiative, 2009, http://www.borealbirds.org/sites/default/files/pubs/report-full.pdf.

B. THE PROBLEM: TAR SANDS SPILLS CANNOT BE CLEANED UP

The two high-profile tar sands spills that have occurred in the United States, in Michigan and Arkansas, led to serious questions about whether tar sands products could adequately be cleaned up, especially when spilled into water. In 2015, in response to these questions, the National Academy of Sciences (NAS) undertook a yearlong study of the environmental fate of dilbit spills from pipelines, including spills into water.[29] Its report, published in February 2016, confirmed that many of the concerns about waterborne tar sands spills (in the form of dilbit) are well founded. This is due to the substantial differences in the chemical and physical composition of dilbit compared with that of conventional oil.[30] These unique characteristics lead dilbit to undergo rapid changes in density, viscosity, and adhesion (stickiness) after it is spilled and exposed to environmental conditions.

Dilbit is a manufactured blend of extra-dense, peanut butter–like bitumen and liquid diluents that are so close to their gaseous state that they rapidly evaporate when exposed to air.[31] This means that, unlike conventional oils that tend to float on water for a long period, dilbit undergoes rapid physical changes that transform it into a dense, heavy substance prone to sinking in water.[32] Table 2 provides a summary of key concerns related to dilbit's environmental fate after a spill.

TABLE 2: PROPERTIES OF WEATHERED DILUTED BITUMEN COMPARED WITH CONVENTIONAL OILS

PROPERTY	CONCERN FOLLOWING WEATHERING OF DILUTED BITUMEN	LEVEL OF CONCERN
Density	Can approach or exceed density of freshwater;[33] can sink into water column and to bottom of aquatic bed; impairs water quality in water column and leads to sheening[34]	HIGHER
Adhesion	Tends to adhere to surfaces; will also adhere to small amounts of sand, clay, or other suspended sediment often found in inland and coastal waters, and submerge; residual oil adheres to animals, amphibians, insects, mammals, tree trunks, and other surfaces[35]	HIGHER
Biodegradability	Because bitumen has already gone through extensive anaerobic biodegradation, spilled bitumen may not further biodegrade and may persist in the environment[36]	HIGHER; more study needed
Toxicity	Limited data; available research suggests chronic toxicity to fish embryos and benthic organisms;[37] studies around tar sands development in Alberta confirm the toxic effects of organic substances and metals released during production[38]	UNCLEAR; more study needed
Burn Residues	Low removal efficiency; residues following burning are sticky and sink easily[39]	HIGHER

While spills of any sort of crude oil are worsened by environmental conditions, dilbit is especially sensitive to what is happening in the environment when it spills. Conditions ranging from high-flowing rivers and turbulent waters to strong winds and large waves could make a dilbit spill impossible to clean up.[40] Even in "ideal" conditions, a spill of diluted bitumen presents significantly heightened challenges to first responders, including a narrower window of time for certain response measures, which could close within as little as six hours after a spill.[41]

Because of this reality, the NAS spent considerable time focusing on whether spill response approaches developed by the oil and pipeline industries and various response agencies would be effective in the event of a dilbit spill in water. Its conclusion, based on the finding that dilbit often "becomes suspended in the water column or sinks to the bottom," is stark: "[T]here are few effective techniques for detection, containment, and recovery of oil that is submerged in the water column, and . . . available techniques for responding to oil that has sunk to the bottom have variable effectiveness depending on spill

29 Committee on the Effects of Diluted Bitumen on the Environment et al., *Spills of Diluted Bitumen from Pipelines: A Comparative Study of Environmental Fate, Effects, and Response* (Washington, D.C.: National Academies Press, 2016), p. 5, www.nap.edu/catalog/21834/spills-of-diluted-bitumen-from-pipelines-a-comparative-study-of.

30 Ibid. "Diluted bitumen has unique properties, differing from those of commonly transported crude oils, which affect the behavior of diluted bitumen in the environment following a spill."

31 Ibid. at p. 25.

32 Concerns about sinking dilbit extend to both freshwater and saltwater, but significant research is needed to fully quantify and understand the extent of the threat dilbits pose to saltwater environments.

33 Ibid. at p. 28 and p. 41.

34 Ibid. at pp. 91-95.

35 Ibid. at p. 26.

36 Ibid. at p. 38.

37 Ibid. at p. 61 and p. 70.

38 Ibid. at p. 63 and p. 70. Studies conducted in the tar sands region of Alberta regarding toxicity in water bodies have confirmed sediment toxicity and increased mortality of certain fish.

39 Ibid. at p. 84.

40 Swift, A., "NRDC Supplemental Submission" at p. 83.

41 Ibid. at pp. 87-88.

conditions."[42] Table 3 provides a summary of key concerns related to the effectiveness—or lack thereof—of existing spill response tools for addressing a dilbit spill.

TABLE 3: EFFECTIVENESS OF EXISTING SPILL RESPONSE TOOLS ON WEATHERED DILUTED BITUMEN[43]		
RESPONSE TOOL	EFFECTIVENESS ON WEATHERED DILBIT	LEVEL OF CONCERN
Booming/Skimming	Less effective after weathering due to increases in viscosity and density and dilbit's propensity to sink	Greater
In Situ Burning	Effective during a narrow window; additional concern that burn residues are sticky and sink[44]	Greater
Dispersants	Rapidly declining effectiveness within first 6–12 hours; ineffective after 12 hours[45]	Greater
Surface Washing Agents	Aggressive techniques needed to achieve cleanup objectives for oil stuck to surfaces	Greater
Submerged/Sunken Oil Detection	Methods for detecting sunken oil are not well established, work slowly, and are severely limited by environmental conditions[46]	Greater
Submerged/Sunken Oil Recovery	Methods for recovering sunken/submerged oil are less effective than for floating oil, are more complex, and may require more aggressive spill response due to persistent threats to public health and the environment[47]	Greater

"Broadly, regulations and agency practices do not take the unique properties of diluted bitumen into account, nor do they encourage effective planning for spills of diluted bitumen." —National Academy of Sciences, 2016[48]

Dilbit also contains a range of compounds that are known to be toxic to plant and animal life. Though research on dilbit's toxicity is scarce, there are two known impacts that are especially concerning in the context of a spill. The first is the rapid evaporation of diluents, which include compounds like benzene, toluene, ethylbenzene, xylene, and hydrogen sulfide.[49] Benzene is a well-known human carcinogen, and inhaling this combination of chemicals, even in small quantities, is also known to cause negative human health impacts like nausea, dizziness, and headaches.[50] The second concern is weathered bitumen's propensity to sink, leading to unrecoverable oil on the river or ocean bottom that can seriously impact benthic organisms and the entire benthic zone (i.e., the critical ecosystems found on river and ocean bottoms).[51]

Tar sands production facilities near Fort McMurray, Alberta.

Seismic lines fragment Alberta's boreal forest as far as the eye can see.

42 Ibid. at p. 3.

43 Ibid. at p. 97. Table based on Figure 5-4 unless otherwise noted.

44 Ibid. at p. 84 and p. 88 (Table 4-2). In situ burning is effective for light, medium, and heavy oil within 96 hours with a removal efficiency of 85–99%. For diluted bitumen, the removal efficiency of burning is 50–75% within 24 hours and is ineffective after 96 hours.

45 Ibid. at p. 88 (Table 4-2). While a conventional oil spill (light to medium) in relatively calm and temperate waters has a 24–72 hour response window with a removal efficiency of 50–75 percent, a diluted bitumen spill has a smaller window of 6–12 hours with a removal efficiency of 0–50 percent.

46 Ibid. at pp. 82-83.

47 Ibid. at p. 88.

48 Ibid. at p. 4.

49 Ibid. at p. 64.

50 Ibid. at pp. 64-65.

51 Ibid. at p. 61.

As the following timeline demonstrates, spills from oil tankers, oil production facilities, and commercial vessels are relatively common and are a serious environmental concern for communities located on rivers and coasts where oil has historically been moved by boat. This history suggests that it is not a question of if tar sands could spill from a tanker, but when.

30 YEARS OF NOTABLE WATERBORNE OIL SPILLS

1985: *GRAND EAGLE*: 435,000 GALLONS of Ninian crude oil spilled into the Delaware River[i]

1988: *NESTUCCA*: 231,000 GALLONS of heavy fuel oil spilled off Washington's outer coast[ii]

1989: *PRESIDENTE RIVERA*: 306,000 GALLONS of heavy fuel oil spilled into the Delaware River[iii]

1989: *EXXON VALDEZ*: 11 MILLION GALLONS of crude oil spilled into Prince William Sound off the coast of Alaska.

1996: *JULIE N.*: 180,000 GALLONS of heating oil spilled into the Fore River near Portland, Maine[iv]

1999: *NEW CARISSA*: 70,000+ GALLONS of fuel oil spilled off Oregon's coast near Coos Bay[v]

2004: *ATHOS 1*: 265,000 GALLONS of Venezuelan heavy crude oil spilled in the Delaware River[vi]

2010: *DEEPWATER HORIZON*: 210 MILLION GALLONS of crude oil spilled into the Gulf of Mexico

2014: *MISSISSIPPI BARGE*: 120,000 GALLONS of clarified slurry oil spilled into the Mississippi River[vii]

2016: *MARATHASSA*: 713 GALLONS of bunker C fuel oil spilled into English Bay near Vancouver, British Columbia[viii]

2016: *NATHAN STEWART*: 29,000 GALLONS of diesel fuel spilled near Bella Bella, British Columbia[ix]

© US Coast Guard

The Deepwater Horizon oil platform exploded in the Gulf of Mexico in 2010.

In addition to these examples, a 2016 report on tar sands transport in the Salish Sea region outlined a lengthy history of problems with barges and tankers in the area, including multiple accidents and spills involving tugs and barges in any given year.[x] This is particularly concerning given that these means of transport would be used heavily for projects like the Trans Mountain pipeline expansion and the Tesoro-Savage and Albany crude-by-rail facilities, all discussed in detail below.

i University of Delaware Sea Grant Program, "1985 Grand Eagle Oil Spill," accessed October 13, 2016, Riverhttp://www.ceoe.udel.edu/oilspill/Grandeagle.html.

ii Neel, J., D. Byers, and C. Hart, "Incident History of the Nestucca Barge," Department of Ecology, State of Washington, May 20, 2010, http://www.ecy.wa.gov/programs/spills/incidents/Nestucca/NestuccaHistory.pdf.

iii University of Delaware Sea Grant Program, "Presidente Rivera Spill—
June 24, 1989," accessed October 13, 2016, http://www.ceoe.udel.edu/oilspill/PresidenteRiveraSpill.html.

iv Pohlmann, L., "Maine Voices: On Anniversary of Julie N Accident, a Warning on Pipeline Proposal," Portland Press Herald, September 27, 2012, http://www.pressherald.com/2012/09/27/on-anniversary-of-julie-n-accident-a-warning-on-pipeline-proposal_2012-09-27/.

v U.S. Fish & Wildlife Service, Oregon Fish & Wildlife Office, "New Carissa Oil Spill: From Response to Restoration," June 7, 2012, https://www.fws.gov/oregonfwo/contaminants/spills/newcarissa/.

vi University of Delaware Sea Grant Program, "Information for the Public,"
accessed October 13, 2016, http://www.ceoe.udel.edu/oilspill/index.html.

vii Valentine, K., "Boat Crash Causes 120,000 Gallons of Oil to Spill into the Mississippi River," ThinkProgress, September 4, 2015, https://thinkprogress.org/boat-crash-causes-120-000-gallons-of-oil-to-spill-into-the-mississippi-river-3c0e3d1f2f11#.6krvbg17b.

viii Johnson, L., "Vancouver Oil Spill Was Small but 'Nasty' and Spread Quickly,"
CBC News, April 14, 2015, http://www.cbc.ca/news/canada/british-columbia/vancouver-oil-spill-was-small-but-nasty-and-spread-quickly-1.3032385.

ix http://www.cbc.ca/beta/news/canada/british-columbia/nathan-e-stewart-tug-recovery-bella-bella-1.3850271.

x Felleman, F., "Tar Sands/Dilbit Crude Oil Movements " at pp. 10-11, Appendix 2.

HISTORY OF TAR SANDS SPILLS IS A STICKY MESS

In 2010, an Enbridge pipeline in Michigan ruptured, spilling more than 840,000 gallons of tar sands dilbit into the nearby Kalamazoo River.[52] After the tar sands oil was released into the environment, the diluents evaporated, causing local residents to experience negative health impacts including "headaches, nausea, respiratory discomfort, and eye irritation."[53] Following evaporation of the diluent, large quantities of the bitumen portion of the oil sank below the river's surface, evading containment tactics designed for conventional oil, which floats. Over the next six years, more than $1 billion was spent on cleanup, making this accident the most expensive pipeline spill in U.S. history. Though the public health impacts were temporary, as of today, further spill remediation has been stopped and nearly 40 miles of the Kalamazoo River remain contaminated.[54]

In 2013, ExxonMobil's Pegasus pipeline ruptured and spilled in Mayflower, Arkansas, releasing up to 300,000 gallons of tar sands oil into a nearby neighborhood and surrounding creeks.[55] In the aftermath, residents were forced to evacuate and eventually abandon their homes. Persistent negative health impacts were reported, and the final sum of cleanup and other spill-related costs will likely exceed $100 million.[56]

Clean-up of the Kalamazoo River tar sands oil spill.

Aftermath of the Mayflower, Arkansas, tar sands oil spill.

C. BULL'S-EYE: THE PLACES THREATENED BY TAR SANDS TANKERS AND BARGES

Since the rejection of Keystone XL in late 2015, the tar sands industry has begun focusing almost exclusively on getting its crude to waterways where it could be loaded onto barges and tankers. No matter the location of these projects, the industry is targeting two primary heavy oil refinery markets: California and the Gulf Coast.[57] Below, we briefly explore the scope of each of these projects and the sensitive areas in the potential line of fire.

TAR SANDS TANKERS THREATENING THE EAST COAST AND GULF OF MEXICO

TransCanada's proposed Energy East pipeline represents the industry's single largest tar sands infrastructure proposal; approval would send 281 oil tankers down the Atlantic coast annually.[58] A $12-billion, 2,850-mile proposed overland pipeline would run from Hardisty, Alberta, to a port facility near Saint John, New Brunswick, carrying up to 1.1 million bpd of mostly tar sands oil.[59] Tankers loaded in Saint John would sail down the Eastern Seaboard to mid-Atlantic and Gulf Coast refineries.[60] The regulatory process to permit the Energy East proposal began in June 2016 and is expected to take at least two years.[61]

52 U.S. Environmental Protection Agency (hereinafter EPA), "EPA Response to Enbridge Spill in Michigan," accessed October 13, 2016, https://www.epa.gov/enbridge-spill-michigan.

53 Michigan Department of Community Health, "Public Health Assessment, Final Release: Evaluation of Air Contamination, Kalamazoo River Enbridge Oil Spill, Calhoun and Kalamazoo Counties, Michigan," September 30, 2015, p. 1, http://www.michigan.gov/documents/mdch/Enbridge_Air_PHA_FINAL_RELEASE_9-30-2015_501495_7.pdf.

54 Enbridge Energy, Enbridge Line 6B MP 608, Marshall, MI Pipeline Release, Case No.: 15-1411-CE, No Further Action Report for Segment 1, prepared for the Michigan Department of Environmental Quality, May 12, 2016, pp. 59-79, http://www.michigan.gov/documents/deq/enbridge-nfa-report-segment-1_534468_7.pdf.

55 White, S., "Exxon Oil Spill Could Be 40% Larger Than Company Estimates, EPA Figures Show," *Inside Climate News,* April 5, 2013, http://insideclimatenews.org/news/20130405/exxon-oil-spill-could-be-40-larger-company-estimates-epa-figures-show.

56 Greenfield Advisor, "How Much Will the Mayflower Oil Spill Cost?" December 2, 2015, https://www.greenfieldadvisors.com/how-much-will-the-mayflower-oil-spill-cost/. RT, "Exxon Oil Spill Town 'Deserted Land,' Residents Still Getting Sick, Forced to Abandon Homes," February 11, 2014, https://www.rt.com/usa/mayflower-keystone-oil-pipeline-410.

57 Additional heavy oil refining capacity in the mid-Atlantic region means that refineries in New Jersey, Pennsylvania, and Delaware are also likely targets for tar sands crudes.

58 Axelrod, J., M. Beer, and A. Swift, "Tar Sands in the Atlantic Ocean."

59 TransCanada Pipeline Limited, Energy East Pipeline Ltd., Consolidated Application, Vol. 1, Section 2, submitted to the NEB, May 2016, p. 5, docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/2432218/2540913/2543426/2957695/A76905-4_V1_Sec2_Project_Overview_-_A5A0G7.pdf?nodeid=2957146&vernum=-2.

60 TransCanada Pipeline Limited, Energy East Pipeline, Consolidated Application, Volume 1, Section 1: Executive Summary.

61 Canada NEB, "Comprehensive Energy East Review Process," accessed October 14, 2016, http://www.one-neb.gc.ca/pplctnflng/mjrpp/nrgyst/mg/nrgstrvwprcss-eng.pdf.

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Killer whales breach off the Washington coast.

© Thomas Shahan/Flickr

Looking east into the Columbia Gorge.

TAR SANDS BARGES ON THE HUDSON RIVER

In Albany, New York, a proposal to move tar sands oil by trains and then barges would load at least 124 barges full of tar sands per year to the Hudson River. These barges would move their cargo to refineries in northern New Jersey, Delaware, and the Gulf Coast.[62] Global Partners, a Massachusetts-based company, currently owns and operates a crude-by-rail terminal at the Port of Albany, handling predominantly crude oil sourced from the Bakken formation in North Dakota. Tar sands oil must be heated to move from rail tank cars to storage tanks and then onto barges. Under proposed changes to the Albany facility, several boilers would be added, giving it a capacity of more than 265,000 barrels of tar sands oil.[63]

TAR SANDS TANKERS THREATENING THE WEST COAST

If Kinder Morgan's Trans Mountain expansion project proceeds, tar sands tanker traffic in the shared waters of the Salish Sea would increase by 580 percent. This proposal involves building a second pipeline close to the company's existing 300,000 bpd tar sands pipeline that runs from Hardisty, Alberta, to Vancouver, British Columbia.[64] Under the plan, the expansion would triple the system's capacity to 890,000 bpd, filling up more than 348 new crude oil tankers per year, up from a maximum of 60 now.[65,66] Once loaded, these tankers would move through crowded and often treacherous waters near the San Juan Islands and Olympic Peninsula in Washington State, most likely to refineries in the San Francisco Bay and Los Angeles areas.

TAR SANDS TANKERS AND BARGES ON THE COLUMBIA RIVER

Tesoro Corp. and Savage Companies have proposed the construction of North America's largest crude-by-rail terminal on the banks of the Columbia River in Vancouver, Washington, potentially adding 122 new tankers and barges carrying tar sands per year along the river. (An additional 243 new tankers and barges would carry other types of oil.[67]) The plan involves building six storage tanks and a rail loop capable of unloading up to 360,000 bpd of oil.[68] Like the Global Partners proposal in Albany, this facility is designed with boilers to handle tar sands crude, and one-third of the project is dedicated to tar sands oil.[69] The tanker and barge traffic created by this project would need to navigate more than 100 miles of the narrow and congested Columbia River channel before reaching the Pacific Ocean.[70] From there, it is expected that they would travel predominantly south to California refineries.

62 Numbers are estimated on the basis of reporting that found that one barge is currently loaded by Global Partners every day. From there we extrapolated based on the total handling capacity that Global Partners hopes to devote to heavy crudes like dilbit as compared with the total currently loaded onto barges. Vieira, A., "U.S. Barge Operators Transport Domestic Crude."

63 Three tanks would be converted to handle heated petroleum products. These tanks have a combined capacity of just over 265,000 barrels. Brower, N., "Re: Global Companies LLC" at p. 49, p. 54, and p. 59.

64 Trans Mountain, "Proposed Expansion."

65 Ibid.

66 Trans Mountain, "Trans Mountain Expansion Project Community Workshop" at p. 8.

67 Tesoro Savage, Application for Site Certification Agreement, Cover Letter. The total number of new barges loaded would be 365 per year, but only one-third would likely be loaded with tar sands crude due to the facility's dilbit handling capacity.

68 Ibid. p. 2-86 and p. 2-104.

69 Tesoro Savage, Draft Environmental Impact Statement, Chapter 1, "Project Background and Purpose and Need," November 2015, p. 1, http://www.efsec.wa.gov/Tesoro%20Savage/SEPA%20-%20DEIS/DEIS%20Chapters/DEIS%20Ch%201%20Background-PurposeNeed.pdf.

70 Tesoro Savage, Application for Site Certification Agreement at pp. 1-16.

TAR SANDS BARGES ON THE MISSISSIPPI RIVER

Back in 2012, during the height of the last oil boom, tar sands producers laid out plans to use several rail terminals alongside the Mississippi River to unload tar sands crude from trains and reload it onto barges.[71] While it is unlikely that producers have continued to rely heavily on this means of transport since crude oil prices crashed in mid-2014, the fact that facilities are still located—and operating—along the Mississippi River points to the future potential threat of at least 130 new barges carrying tar sands crude on the river each year.[72]

TABLE 4: SENSITIVE AREAS POTENTIALLY IMPACTED BY TAR SANDS BARGES AND TANKERS

	ENERGY EAST	ALBANY CBR[73]	TRANS MOUNTAIN	TESORO-SAVAGE	MISSISSIPPI CBR
Atlantic Coast	✔	✔			
New England Seamounts/Canyons	✔	✔			
Hudson River		✔			
New York Harbor	✔	✔			
Chesapeake Bay	✔	✔			
Florida Keys	✔	✔			
Gulf Coast	✔	✔			✔
Mississippi River					✔
Vancouver Harbor			✔		
Salish Sea			✔	✔	
Pacific Coast			✔	✔	
Columbia River				✔	
San Francisco Bay			✔	✔	
Los Angeles			✔	✔	

D. RESOURCES AT RISK: WHAT WE COULD LOSE IF TAR SANDS SPILLED

A tar sands spill in America's oceans or rivers or on its coastlines would be disastrous. Key economic sectors—including valuable commercial fisheries and vibrant coastal cities and towns—would be put in peril, as would some of America's most ecologically important ocean areas.

- In 2014, U.S. fisheries potentially impacted by tar sands tankers and barges supported a commercial harvest of 1.7 million metric tons, with a market value of $3.6 billion.[74] Of the eight regional fishery management areas in the United States, five are located directly in the pathways of tar sands barges and tankers discussed in this report.[75]
- Most of the U.S. coastline supports thriving ocean-based economies, many of which are located close enough to expected tar sands barge and tanker routes to cause alarm.[76] Key areas include the Maine coast and Acadia National Park; Cape Cod; New York Harbor; Chesapeake Bay; the Florida Keys; the Gulf Coast; the mouth of the Columbia River; Puget Sound, the San Juan Islands, and the Salish Sea; San Francisco Bay; and Long Beach, California.

71 Cooper, D., "Rail's New Oil Rush." O'Meara, D., "Barges Shine in Summer of Alternatives."

72 *See generally*: Oil Change International, "North America Crude by Rail," accessed October 14, 2016, http://priceofoil.org/rail-map/. The figure of 130 is based on numbers provided by the articles in the previous citation. MEG Energy entered into contracts that would have allowed it to move 40,000 bpd by barge, an amount requiring around 88 six-barge tugs per year. Downriver, Altex entered into a contract with Genesis Energy to move 12,000 rail cars of tar sands from rail to barge, a number requiring 43 six-barge tugs per year.

73 "CBR" is an acronym for "crude by rail."

74 National Oceanic and Atmospheric Administration (hereinafter NOAA), National Marine Fisheries Service, "Fisheries of the United States, 2014," September 2015, p. 8, https://www.st.nmfs.noaa.gov/Assets/commercial/fus/fus14/documents/FUS2014.pdf.

75 NOAA Fisheries, "Regional Fishery Management Councils," accessed October 14, 2016, http://www.nmfs.noaa.gov/sfa/management/councils.

76 Houston, J.R., "The Economic Value of Beaches: A 2008 Update," *Shore & Beach* 76, no. 3 (2008): 22-26, http://www.wcu.edu/WebFiles/PDFs/Economic_Value_of_Beaches_2008.pdf.

Freshly caught lobster in Maine.

Fishing boats at anchor in Portland, Maine.

- Several special ocean areas essential to marine wildlife fall within or are adjacent to expected tanker routes. About 150 miles off the coast of Cape Cod, a series of ocean canyons and seamounts covered in rare cold-water corals provide feeding grounds and habitat for whales, dolphins, fish, and unique deep-sea creatures.[77] The Florida Keys National Marine Sanctuary is home to the world's third largest barrier reef, a resource that supports abundant marine life and protects the coast of mainland Florida from erosion and its wetlands from saltwater incursion.[78] Along the West Coast, a suite of newly protected marine areas provides refuge for ocean life up and down California's coast. Farther north, the Olympic Coast National Marine Sanctuary protects a productive ocean zone that supports many communities, including Native American tribes whose cultural ties to this area extend back thousands of years.[79]
- Along the entire East coast, breeding and feeding habitat for critically endangered marine mammals lies directly in the potential path of Energy East tankers—likely placing dwindling North Atlantic right whale and fin whale populations at risk from oil spills, ship collisions, and debilitating noise.[80] On the West coast, tankers from Vancouver, British Columbia, would cross critical orca habitat, threatening the endangered Southern Resident killer whale population.[81]
- The Columbia and Mississippi Rivers are the lifeblood of the areas they move through, providing drinking water, critical fish habitat, irrigation, transportation, and tourist destinations. Ninety-two percent of U.S. agricultural exports depend on and are produced within the Mississippi River Basin, and one of the most important salmon runs in U.S. waters relies on the health of the Columbia River ecosystem in Washington and Oregon.[82,83]

Coho salmon coming home to spawn in freshwater after traveling hundreds of miles up the Columbia and Snake Rivers.

77 NRDC, "Protecting America's Deep Sea Treasures: The New England Coral Canyons and Seamounts Area," March 2015, https://www.nrdc.org/sites/default/files/new-england-deep-sea-treasures-IB_0.pdf.

78 NOAA, "About Florida Keys National Marine Sanctuary," Florida Keys National Marine Sanctuary, July 19, 2016, http://floridakeys.noaa.gov/about/welcome.html?s=about.

79 Gordon, D.G., "History Lessons: Learning from the Past to Protect Marine Resources for the Future," NOAA, accessed October 14, 2016, http://www.publicaffairs.noaa.gov/sanctuary/vol2no1/v1his.html.

80 Axelrod, J., M. Beer, and A. Swift, "Tar Sands in the Atlantic Ocean" at pp. 9-10.

81 NOAA, "Southern Resident Killer Whale Critical Habitat," accessed October 14, 2016, http://www.fisheries.noaa.gov/pr/pdfs/criticalhabitat/killerwhale_sr.pdf.

82 National Park Service, "Mississippi River Facts," accessed October 14, 2016, https://www.nps.gov/miss/riverfacts.htm.

83 Columbia River Inter-Tribal Fish Commission, "Columbia Basin Salmonids," accessed October 14, 2016, http://www.critfc.org/fish-and-watersheds/columbia-river-fish-species/columbia-river-salmon.

II. Taking Action to Confront the Threat

Given aggressive efforts by the tar sands industry to build pipelines to the Pacific and Atlantic Oceans, a flood of tar sands tankers may soon arrive in waters under the jurisdiction of the United States. But the United States is ill-prepared for this flood of vessels. U.S. decision makers at all levels of government have a responsibility and opportunity to confront this threat before a catastrophic spill occurs.

While response agencies can take actions to be better prepared in the event of a dilbit spill, the lack of proven spill response technologies and the absence of research on key issues such as toxicity and saltwater spills suggest there is not currently a defensible technical or regulatory approach for allowing tar sands tankers into U.S. waters. In other words, even if all measures were taken and new spill response regimes were developed, they would not guard against the potential for a spill that would leave a legacy of tar sands contamination in riverine or marine ecosystems.

RECOMMENDATION 1

In light of the latest science and given the absence of proven technologies and mechanisms to respond to and clean a dilbit spill, policymakers at state and federal levels should exercise their regulatory power to reject vessel response plans for ships transporting diluted bitumen crude oil.

The U.S. Coast Guard and the EPA have jurisdiction over response plans for tankers and barges traveling on U.S. waters.[84] This authority allows each agency to closely evaluate and then approve or disapprove spill plans for vessels loaded with tar sands dilbit. Exercising their authority to decline approval of these plans would recognize the conclusions of the best available science, not to mention the continued lack of spill cleanup methods that consistently and predictably work for dilbit.

Already, federal agencies have publicly acknowledged concern related to response tactics for spills of tar sands dilbit in water, and their concerns have been strongly borne out by real-world experiences and the latest NAS study.[85,86] Some federal agencies have taken a hard look at the unique risks associated with tar sands dilbit and are actively considering how to prepare for a possible increase in the number of tankers and barges carrying the substance.

States also have the authority to take preventive action above and beyond what is required by the federal government and its spill response agencies.[87] In the absence of federal action, this authority may be particularly important in responding to the threat posed by these tar sands pipeline and tanker schemes. Thus, similar to actions that the federal government could and should take, states should look at systems for the classification of crude oils, new requirements related to spill response planning that fully address the risks of oils like dilbit, and increased public notification and awareness efforts.

84 *See, e.g.:* EPA, "Oil Spills Prevention and Preparedness Regulations," accessed October 14, 2016, https://www.epa.gov/oil-spills-prevention-and-preparedness-regulations.

85 McGowan, E., and L. Song, "The Dilbit Disaster: Inside the Biggest Oil Spill You've Never Heard Of," Part 1, *Inside Climate News,* June 26, 2012, http://insideclimatenews.org/news/20120626/dilbit-diluted-bitumen-enbridge-kalamazoo-river-marshall-michigan-oil-spill-6b-pipeline-epa. *See:* Vice Admiral Paul Zukunft's responses to Senator Maria Cantwell, "Nominations to the U.S. Coast Guard and the Consumer Product Safety Commission," hearing before the Committee on Commerce, Science, and Transportation, Senate, 113 Congress, Second Session, April 8, 2014, https://www.congress.gov/113/chrg/shrg94057/CHRG-113shrg94057.htm.

86 Committee on the Effects of Diluted Bitumen on the Environment et al., *Spills of Diluted Bitumen from Pipelines*.

87 Legal source--33 USC section 2718(a)(1)(A).

IS THE TAR SANDS TANKER THREAT REAL?

The tar sands industry's plan to triple production by 2030 has been hampered by opposition to new oil infrastructure proposals as well as lower oil prices.[88] Still, the industry aims to expand production by nearly 57 percent over the next 14 years.[89] This would mean bringing more than 1.6 million bpd of new production online—which would require new pipelines to take the crude to market.[90]

At the same time, Alberta recently announced a new set of climate policy plans, one of which caps carbon emissions from the tar sands industry at 100 megatons per year.[91] If the industry continues current operations, the cap wouldn't allow for much growth.[92] However, models of industry growth suggest that, with more efficient production technologies, the industry could expand by 1.5 million bpd without violating Alberta's carbon cap.[93] Either way, Alberta's emissions models under its new climate policy show that its proposed plans aren't enough, and policymakers admit that proposed changes "will not place Alberta on a trajectory consistent with global 2 degrees Celsius goals."[94]

As the Canadian Association of Petroleum Producers so succinctly states in its latest industry analysis: "Eastern Canada, California, and Washington represent opportunities for expanded markets in North America for Canadian crude oil by 2020." It goes on to state that "[p]ipeline capacity is currently tight, and operational constraints can and have at times reduced the available capacity to below nameplate capacity. The growing Western Canada crude oil supply volumes forecast until 2020 require increased pipeline capacity if these supplies are to access markets."[95] In other words, nearly all of the industry's future plans are contingent on the approval of current pipeline proposals that put our precious fresh waters, marine resources, and coastal communities at risk.

RECOMMENDATION 2

Because large quantities of tar sands crude are already moved by pipeline and rail—and in light of the possible increase in waterborne transport of tar sands—entities at all levels of government tasked with spill response should take immediate steps to evaluate existing legal, policy, and research priorities.

To facilitate these steps, they should:

- Conduct a rigorous public review to evaluate the current regulatory framework governing the transport of diluted bitumen and other non-floating oils as well as the effectiveness of spill response planning. This review should evaluate, among other things, risks posed to water and public safety. The review should explore developing new or updated regulatory classifications for crude oils that ensure tar sands diluted bitumen is clearly differentiated not only from other heavy oils, but also from all conventional crude oils. Such updates should also clarify the facility response plan framework applicable to Class V, or non-floating, oils.[96]

88 CAPP, "Crude Oil" at p. 5.

89 CAPP, "Crude Oil" at Appendix B.2

90 Rail is often mentioned either as a realistic transportation alternative or as an argument by industry as to the wisdom of building new pipelines (because pipelines are seen as "safer" by industry players). However, at current prices, rail is uneconomical for tar sands producers, even to the closest available markets. In many cases, oil prices would need to at least double for producers to view rail as a viable alternative to pipelines. In today's environment of oversupply, flattened demand, and aggressive actions to reduce carbon emissions, a price rebound in that range is seen as increasingly unlikely.

91 Alberta Government, "Capping Oil Sands Emissions," accessed October 14, 2016, http://www.alberta.ca/climate-oilsands-emissions.aspx.

92 Emissions were estimated at 70 megatonnes per year in 2014 when production totaled 2.6 million bpd. Since that time, production has expanded by at least 300,000 barrels, suggesting that emissions could be close to 80 megatonnes. If this is the case, the 100 megatonne cap could be hit within the next 2–3 years. Alberta Government, "Capping Oil Sands Emissions." CAPP, "Crude Oil" at Appendix A.2.

93 Industry analysts have stated that basic emissions figures point to the possibility of 1.2 million bpd of expansion under the cap if operators simply continue under business as usual. Snyder, J., "Could Alberta's Cap on Oil Sands Emissions Hinder Growth?" *Alberta Oil Magazine*, May 11, 2016, http://www.albertaoilmagazine.com/2016/05/albertas-cap-oil-sands-emissions-hinder-growth/. However, efficiency increases—i.e., decreases in production emissions—are a goal of the industry and are likely to result in additional expansion under the cap. Meanwhile, operating and approved projects are forecast to cause industry expansion of at least 1.6 million bpd by 2030. CAPP, "Crude Oil" at Appendix B.2. Against this backdrop, the cap has yet to be implemented; industry began to fight it the day it was announced, suggesting that it may not ever be imposed. Cattaneo, C., "Alberta Premier Rachel Notley Facing Backlash over Oilsands Emissions Cap," *Financial Post,* December 9, 2015, http://business.financialpost.com/news/energy/alberta-premier-rachel-notley-facing-backlash-over-oilsands-emissions-cap?__lsa=2066-78ce.

94 Alberta Government, "Climate Leadership: Report to Minister," November 20, 2015, p. 11, http://www.alberta.ca/documents/climate/climate-leadership-report-to-minister.pdf.

95 CAPP, "Crude Oil" at p. 21 and p. 23.

96 A variety of federal agencies would be implicated in such a rule-making, though the lead agencies would be the U.S. Coast Guard and the EPA. Additional agencies could include the Pipeline and Hazardous Materials Safety Administration and any agency relying on facility response plans and oil classifications created by regulations promulgated under the Clean Water Act and the Oil Pollution Act. While a rulemaking is underway, the transportation of dilbits by tanker and barge should be suspended.

- Support new, targeted research into the impact of tar sands crude oils when spilled in a variety of marine and freshwater environments. Any new research must study a diverse array of tar sands crude oils that represent an honest cross-section of the types of oils produced in Alberta's tar sands. Further research must focus on continually identified knowledge gaps, including:
  - Transport and behavior when spilled ("fate") in the environment
  - Fate of diluted bitumens spilled in a variety of saline environments
  - Ecological and human health risks of weathered diluted bitumen
  - Detection, tracking, and quantification of submerged and sunken oil
  - Techniques to intercept and recover submerged oil as it moves and sinks
  - Alternatives to dredging and other high-impact activities for recovery of sunken oil, including development of technologies likely to be effective in both shallow rivers and the deep offshore
- Governments should also investigate and report on the broader environmental and economic ramifications of a cumulative increase in tar sands tanker and barge traffic through U.S. ports and waters.

More broadly, decision makers in both Canada and the United States must take a hard look not just at whether tar sands crude can be safely shipped on our rivers or oceans, but at how enabling the continued growth of carbon-intensive tar sands production threatens our fragile climate. The realities of climate change dictate a different course altogether, one in which we dedicate resources not to prolonging our dependence on fossil fuels, but to accelerating our transition away from them.

We already have numerous paths toward this transition that have been proven to drive job creation and economic growth.[97] These include a wide variety of public policy options, including building efficiency programs, incentivizing innovation in renewable energy sectors, electrifying our vehicle fleets, and supporting job training programs that enable workers to move into renewable energy and carbon-neutral industries.[98]

97 *See, e.g.:* Koronowski, R., "U.S. Solar Created More Jobs Than Oil and Gas Extraction," *ThinkProgress*, January 12, 2016, https://thinkprogress.org/u-s-solar-created-more-jobs-than-oil-and-gas-extraction-8634b2aff1f6#.d5mawrc6j. American Wind Energy Association, "US Wind Power Jobs Hit Record, Up 20 Percent in 2016," press release, April 12, 2016, http://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=8736.

98 *See generally:* Goldstein, D.B., *Invisible Energy—Strategies to Rescue the Economy and Save the Planet* (Richmond, CA: Bay Tree Publishing, April 16, 2010), http://www.baytreepublish.com/invisible-energy/. International Energy Agency, "Energy Technology Perspectives," accessed October 14, 2016, http://www.iea.org/etp/. Todd, J., J. Chen, and F. Clogston, "Creating the Clean Energy Economy: Analysis of the Electric Vehicle Industry," International Economic Development Council, 2013, http://www.iedconline.org/clientuploads/Downloads/edrp/IEDC_Electric_Vehicle_Industry.pdf. U.S. Department of Energy, "Clean Energy Jobs and Career Planning," accessed October 14, 2016, http://energy.gov/eere/education/clean-energy-jobs-and-career-planning.