Migration of whooping cranes (*Grus americana*) through Alberta's bitumen sands region

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The endangered whooping crane is an archetypal symbol of North American conservation. This magnificent bird, the tallest bird in North America, is endangered in both Canada and the United States (COSEWIC 2010). The only remaining self-sustaining wild population of whooping cranes in the world breeds in Wood Buffalo National Park, located in the Northwest Territories and northern Alberta (COSEWIC 2010).

There is little evidence on the public record that the Governments of Alberta and Canada adequately considered whooping cranes in land use planning, approvals of industrial developments, and allocation of long-term bitumen concessions (i.e., tenures) in Alberta's

bitumen sands region. Two examples of recent government approvals of major bitumen sands projects illustrate this lack of adequate consideration:

1. **Kearl Oil Sands Project** – The Aboriginal Deninu Kue First Nation has expressed their apprehension about this project. "Concerns extended to Wood Buffalo National Park, due to the park's close proximity to the oil sands region, and more specifically, the possibility of air emissions reaching the nesting sites of the Whooping Crane, which was on the endangered species list" (ERCB/CEAA 2007; 13.4 page 56).

   Despite these worries, Imperial Oil stated that: "the KOS Project would not result in unacceptable adverse environmental impacts" (ERCB/CEAA 2007; 13.1. Page 54), and that: "it was confident that a stable, self-sustaining natural landscape that would result in an equivalent land capability could be re-established. Imperial Oil further stated that the closure landscape would support a suite of current land uses in the area and would result in a net benefit for some resources, such as several wildlife species and fish habitat" (ERCB/CEAA 2007; 20.1. Page 98).

   The Alberta-Canada Joint Panel concluded that: "the KOS (Kearl Oil Sands) Project is not likely to significantly affect the capacity of renewable resources to meet the needs of present and future generations. The Joint Panel is of the view that Imperial Oil has proposed adequate mitigation measures" (ERCB/CEAA 2007; 20.2. Page 99).

2. **Joslyn North Mine Project** -- The Alberta-Canada Joint Panel noted that: "TOTAL did not assess the project's potential impacts to the endangered whooping crane. It stated that it was not aware of any conflicts between oil sands projects and whooping cranes" (ERCB/CEAA 2011; 6.1.1 29).

   The Joint Panel received comments from several Aboriginal groups (Non-Status Fort McMurray Band Descendants, Athabasca Chipewyan First Nation, Clearwater River Band No. 175; Fort McKay First Nation and Métis Nation Local #63) that wildlife concerns were not adequately addressed, including: "TOTAL's species at risk assessment should have included … whooping crane…" (ERCB/CEAA 2011; 6.1.2 Page 35).

   The Joint Panel noted that: "TOTAL committed to some mitigation measures to avoid or lessen effects on species at risk in the local study area but proposed to rely primarily on reclamation to mitigate these effects, meaning that the effect on these species would last several decades," (ERCB/CEAA 2011; 6.1.3.1 page 40). The panel went on to say that: "In TOTAL's view, the effects on species at risk would not be significant because, in the very long term, biodiversity would not be reduced. (ERCB/CEAA 2011; 6.1.3.1 page 41).

   The Joint Panel approved the project, stating that is was: "satisfied that some combination of these measures can be used to make the impacts to species at risk less than significant. (ERCB/CEAA 2011; 6.1.3.1 page 42).

Global Forest Watch Canada undertook this project to map publicly-available information of the flight paths and landing points of whooping cranes in relation to Alberta's bitumen sands (also

known as oil sands and tar sands) because the Alberta Government is nearing final decisions regarding land uses, including the establishment of conservation areas in this region.

Knowing the flight paths and landing point locations of this globally rare species in relation to Alberta's bitumen sands region is critical to ensuring that management decisions reflect the needs of migratory whooping cranes. Additionally, it may encourage the Alberta Government to make appropriate decisions in favour of conserving and re-establishing this species.

What is the status and distribution of whooping cranes?

Whooping cranes were designated as endangered in 2000 by Canada's COSEWIC (Committee on the Status of Endangered Wildlife in Canada). The species is currently listed as endangered on Schedule 1 of Canada's *Species at Risk Act* and is protected in Canada under the *Migratory Birds Convention Act*, *National Parks Act*, *Canada Wildlife Act*, and *Species at Risk Act*, as well as by provincial and territorial wildlife acts (COSEWIC 2010). In Alberta, the whooping crane is currently ranked 'At Risk,' meaning the species is in danger of local extinction. The *Alberta Wildlife Act* lists the whooping crane as endangered. It is protected in the United States by the *Migratory Bird Treaty Act* and the *Endangered Species Act* (White 2001).

Whooping cranes live only in North America (Canadian Wildlife Service and U.S. Fish and Wildlife Service 2007). Canada is the summer home to the entire naturally occurring, migratory global breeding population of whooping cranes (the Wood Buffalo-Aransas flock). Recent successful re-introduction of small populations has been observed in Wisconsin and Florida; but none of these birds enter Canada (Canadian Wildlife Service and U.S. Fish and Wildlife Service 2007).

The birds were never common, but likely more than 10,000 once occupied North America (COSEWIC 2010). The population reached an all-time low of 14 adults in 1938 (COSEWIC 2010). As of winter 2008, the wild Canadian population, or Wood Buffalo-Aransas population, comprised 270 birds, including 39 young of the year (COSEWIC 2010). The Wood Buffalo-Aransas population increased by 40% in the 10-year period between 1998 and 2008 (COSEWIC 2010). The introduced Florida population had 30 birds, while the other introduced population in the eastern United States had 88 birds (COSEWIC 2010).

Most of the Wood Buffalo-Aransas population breeds in Wood Buffalo National Park, with a few birds breeding on lands outside the park. All of the birds breed north of Alberta's bitumen sands (COSEWIC 2010). The Wood Buffalo-Aransas population migrates mostly as separate family groups and pairs on a northwest to southeast flight path of about 4,000 km to its wintering area in and around Aransas National Wildlife Refuge in coastal Texas (COSEWIC 2010). Migration in the fall begins about mid-September and arrival on the Texas wintering grounds occurs in late October to mid-November, with some birds taking up to 50 days to complete their migration. Spring migration from Texas to Wood Buffalo National Park normally takes place from late March to late April and is usually completed in 2-4 weeks.

What are the reported-to-date threats to the survival of wild whooping cranes?

The *International recovery plan for the whooping crane* (Canadian Wildlife Service and U.S. Fish and Wildlife Service 2007) reports that historic population declines resulted from habitat destruction, shooting, and displacement by human activities. Current threats include limited genetics of the population, loss and degradation of migration stopover habitat, power transmission lines, degradation of coastal ecosystems, and chemical spills in Texas. The recovery plan identified mortality of juvenile birds during the migration period as one of the most serious recent threats to the recovery of this Wood Buffalo-Aransas population.

The recent COSEWIC report (COSEWIC 2010) concluded that the Canadian population is vulnerable on its wintering grounds in Texas, where it is threatened by continued habitat loss from human development, sea level rise, erosion of habitat, reduction of freshwater inflows, increased human disturbance, reductions in key food resources, and catastrophic events such as hurricanes, droughts, and chemical spills.

To date, threats posed to whooping cranes by Alberta's bitumen sands industrial developments have not been adequately addressed in whooping crane status reports even though there has been recent whooping crane sightings over Fort McMurray by credible observers (Anonymous, pers. comm., July 2011), as well as recent whooping crane satellite monitoring and mapping of flight paths and landing points (W. Wehtje, pers. comm., July 2011.). There has also been observations of a whooping crane with an oiled breast at a landing point in Nebraska in the fall (Anonymous, pers. comm., July 2011).

Why be concerned about whooping cranes in Alberta's bitumen sands region?

Whooping cranes fly over and land in Alberta's bitumen sands region. This poses a threat to the survival and recovery of the Canadian wild whooping crane population. The threat results from seven factors:

1. **Whooping cranes fly over Alberta's bitumen sands region.** Whooping cranes have long been known to fly over the Alberta's bitumen sands (Map 1) twice each year – on their way to and from their wintering grounds in Texas and their breeding grounds in Wood Buffalo National Park (Kuyt 1992). Recent whooping crane sightings have been reported over Fort McMurray by credible observers (Anonymous, pers. comm., July 2011).

2. **The Alberta bitumen sands development is large and growing.** The Alberta bitumen sands development is one of the largest energy projects in the world. Alberta's bitumen-bearing sands are currently estimated to contain about 170 billion barrels of bitumen that are economically recoverable, the second or third largest oil-related deposit after Saudi Arabia and Venezuela (Meyers et al. 2007). Annual bitumen production is rapidly

increasing and more than doubled from 21.2 M m3/yr in 1998 to 47.9 M m3/yr in 2009 (AERCB 2009) and is projected to double by 2020 (CAPP 2009).

3. **Toxic tailings ponds (lakes) are large and growing.** Bitumen is extracted by two methods, *in situ* well-based approaches and truck and shovel open pit mining. The latter method produces a mixture of wastewater, residual hydrocarbons, brine, silts and clays, and metals that are discharged into tailings "ponds". The extent of tailings ponds in north-eastern Alberta grew by 422% between 1992 and 2008 (Timoney and Lee 2011) (Map 2). By 2011, mining had disturbed 663 km^2 of boreal landscape, with tailings ponds covering more than 170 km^2 (Government of Alberta 2011 a, b).

4. **Water and air pollution.** Development of the bitumen sands, including mining, processing, and tailings pond leakage, has raised concerns about pollution in water systems and wetlands (Timoney and Lee 2009). In addition to watershed disturbance, the process of upgrading bitumen to synthetic crude oil involves coking, coke combustion, and production of wastes and fly ash that includes numerous elements considered priority pollutants under the US Environmental Protection Agency's Clean Air Act (Kelly et al. 2010). Declines in water quality of the Athabasca River and its surrounding wetlands could render the region inhospitable to cranes.

5. **Government and bitumen companies do not adequately monitor environmental impacts.** Scientific reviews of current environmental monitoring have concluded that they are unable to assess regional environmental change and its causality (Ayles et al. 2004; Dowdeswell et al. 2010; Auditor General of Canada 2010). Although industry and government have claimed that human health and the environment are not at risk from bitumen development (Government of Alberta 2000; WBEMA 2007) and that toxins in the ecosystem are naturally-occurring (Government of Alberta 2010), scientific evidence contradicts those claims (Timoney and Lee 2009, 2011; Kelly et al. 2009; Kelly et al. 2010).

6. **Bird deterrents are not 100% effective.** Water bodies along bird migration routes attract many bird species because they afford foraging, roosting, nesting, and resting opportunities (Ronconi 2006). A variety of deterrents have been used to discourage waterbirds from landing on tailings ponds, including floating and beach effigies, propane scare cannons, and sound-producing systems (Timoney and Ronconi 2010). Despite the use of these deterrents, birds land at tailings ponds and may become oiled. A proportion of the oiled birds later die. Oiling mortality appears to be high for gregarious species, particularly for diving birds (Clark 1984). Bird migration is affected by weather because birds are more likely to land when they encounter headwinds, low temperatures, and precipitation (Newton 2007). Storms may increase the likelihood of bird oiling at tailings ponds, and inclement weather may increase the probability of mass mortality events. Annual bird mortality at the bitumen tailings ponds in northeastern Alberta has been estimated at 458 to 5,029 birds (Timoney and Ronconi 2010).

7. **Oiled and toxin-ingesting birds have low survival rates.** Oiled ducks may suffer from reduced insulation, increased metabolic rate, and hypothermia even from small amounts

of oil (Hartung 1967; McEwan and Koelink 1973). Survival rates of rehabilitated birds may be as low as 1 to 20% for some species (Mead 1997). Birds from at least 43 species have died due to exposure to tailings ponds in the area, mostly waterbirds such as dabblers and divers (Timoney and Ronconi 2010). Mortality rates may be high even at small ponds (Dyke et al. 1976). There may be continual ‘‘incidental take’’ of birds during the open water season, especially at night when human observations are impractical. Oiled birds in tailings ponds have been observed to sink out of sight (Dyke et al. 1976), minimizing the chance of detection (Timoney and Ronconi 2010).

Whooping crane flight paths and landing points in Alberta’s bitumen sands region

Methods

In light of the Alberta government continuing consideration of new bitumen sands projects, the task of documenting the flight paths and landing points of whooping cranes within Alberta’s bitumen sands region is urgent.

Various agencies and organizations cooperate to monitor and map whooping crane flight paths and landing points, including as recent as the fall of 2010. Although Global Forest Watch Canada had acquired these data on the flight paths and landing points within Alberta bitumen sands region, the Canadian Wildlife Service, the US Fish and Wildlife Service, the U.S. Geological Survey, and the Crane Trust asked us not to map and publish these data. In respect of this request, this report uses other publicly-available information on flight paths and landing points (Kuyt 1992). The geographic locations of flight paths and landing points were generalized to protect the cranes.

There are two principal reasons for not releasing raw data on sites used by whooping cranes during migration (W. Wehtje, pers. comm. 2011). First, raw data are preliminary, representing a small subset of data that they have been collected. This means interpretation of this data may be premature and lack proper context. Second, release to the public of raw data on whooping crane locations could be detrimental to cranes by causing disturbance from well-meaning crane watchers or intentional degradation of habitat by private landowners and concession/tenure holders. Researchers are in the early stages of a multi-year study to monitor whooping crane movements during migration, including through Alberta’s bitumen sands region. During the next three years, researchers plan to collect more data, subject them to scientific analyses, and produce reports suitable for public release.

The information we used recorded the following methods for tracking whooping cranes (Kuyt 1992):

“In 1981, 1982, and 1983, 15 juvenile Whooping Cranes were captured on the breeding range and equipped with single radio transmitters….. Radio contact with migrating cranes was maintained by means of leg-band radio transmitters, antennas attached to aircraft struts, and radio receivers carried in the aircraft. Radio signals could be picked up from distances up to 155 km, with shorter receiving ranges (up to 56 km) when cranes were on the ground.”

From that report, figures were scanned into in a digital format, and geographically positioned using ESRI software by aligning multiple known geographic points on the report's maps with already-known positioned features on the ground.

Results

Migrating whooping cranes fly over existing bitumen sands developments and their related concessions to oil, gas and bitumen companies. Using the older public data, whooping cranes landed within present-day bitumen sands concessions/tenures and they were in proximity to present-day facilities and tailing ponds (lakes) (Map 3).

Flight paths and landing points from more recent data (fall 2010) expand upon and corroborate the data used in this report.

Implications of Alberta's bitumen sands developments to whooping cranes

Development of Alberta's bitumen sands creates several implications for whooping cranes:

- Exposure to air emissions, food web contaminants, and declining water quality may result in bird mortality, stress, and reduced fitness.

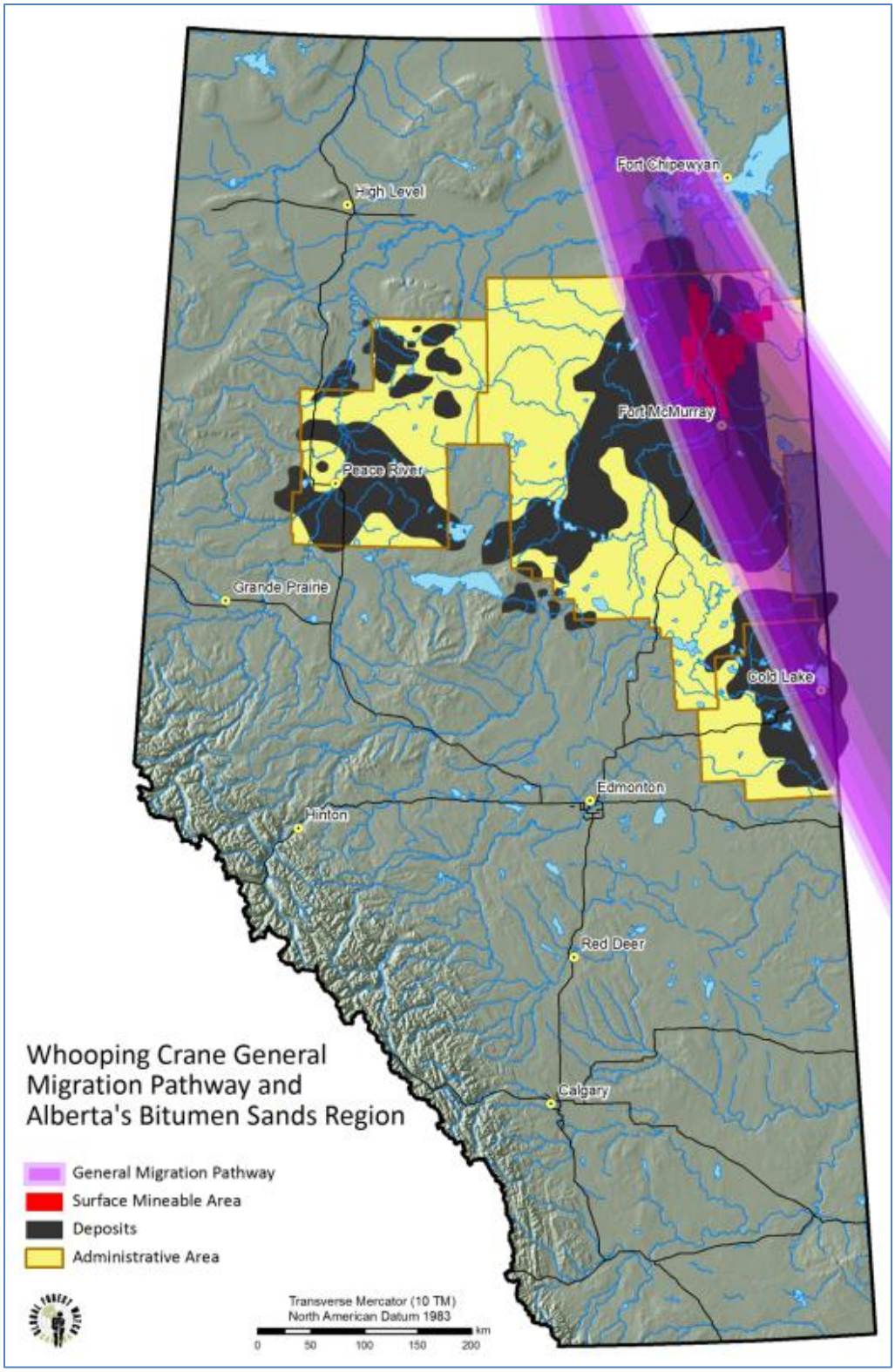
- Exposure to the expanding power line infrastructure may result in bird mortality or injury.

- Exposure to tailings ponds puts the cranes at risk of oiling and ingestion of toxins. This exposure may result in direct mortality or reduced fitness for birds that continue migration. Given inclement weather during migration, particularly in spring, a portion of the Wood Buffalo-Aransas flock could perish in a single mortality event.

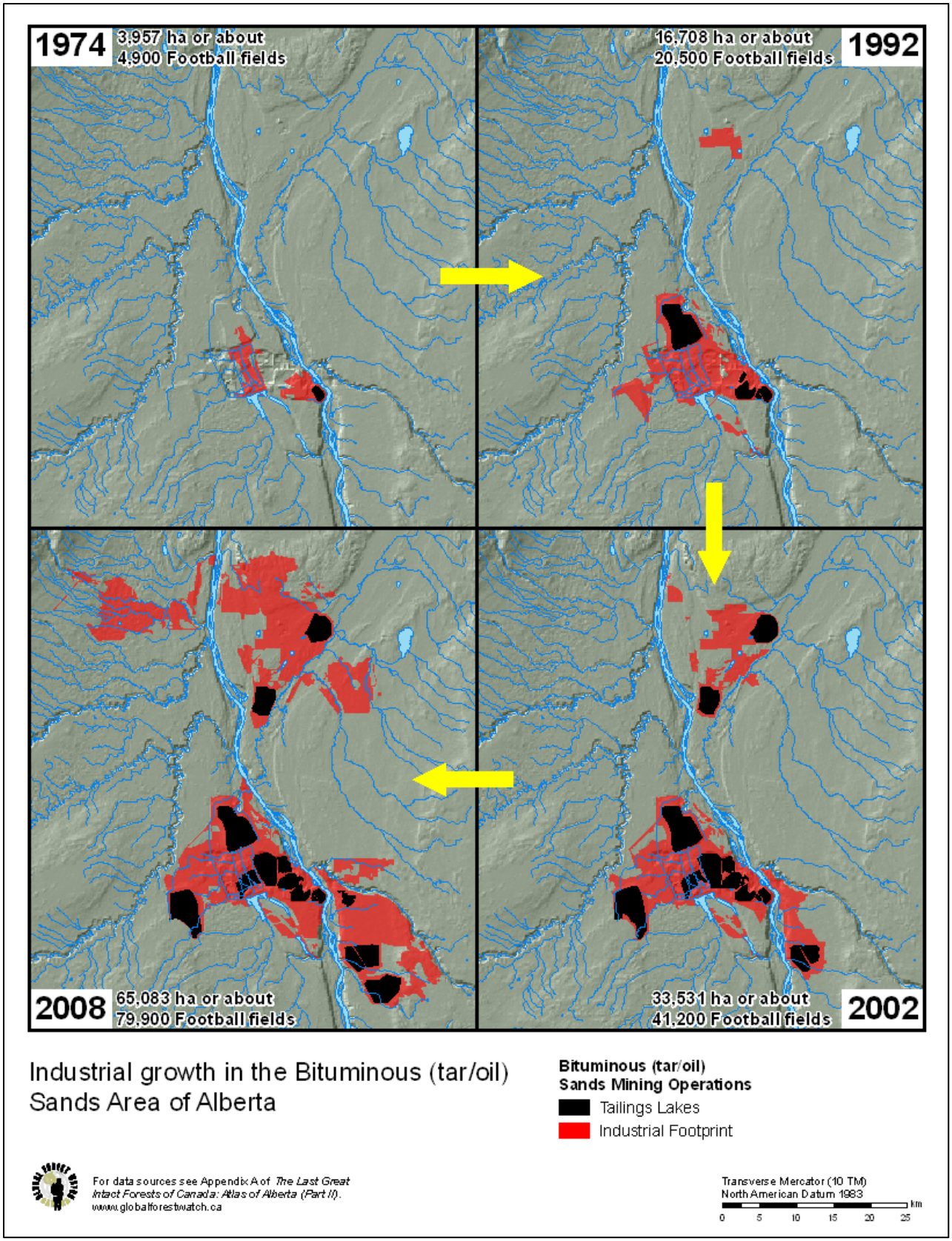
- Exposure to increasing numbers of people employed in the region means an increased risk of human-crane conflicts.

- Lack of sufficient credible scientific monitoring of migration, landing, and mortality hampers management.

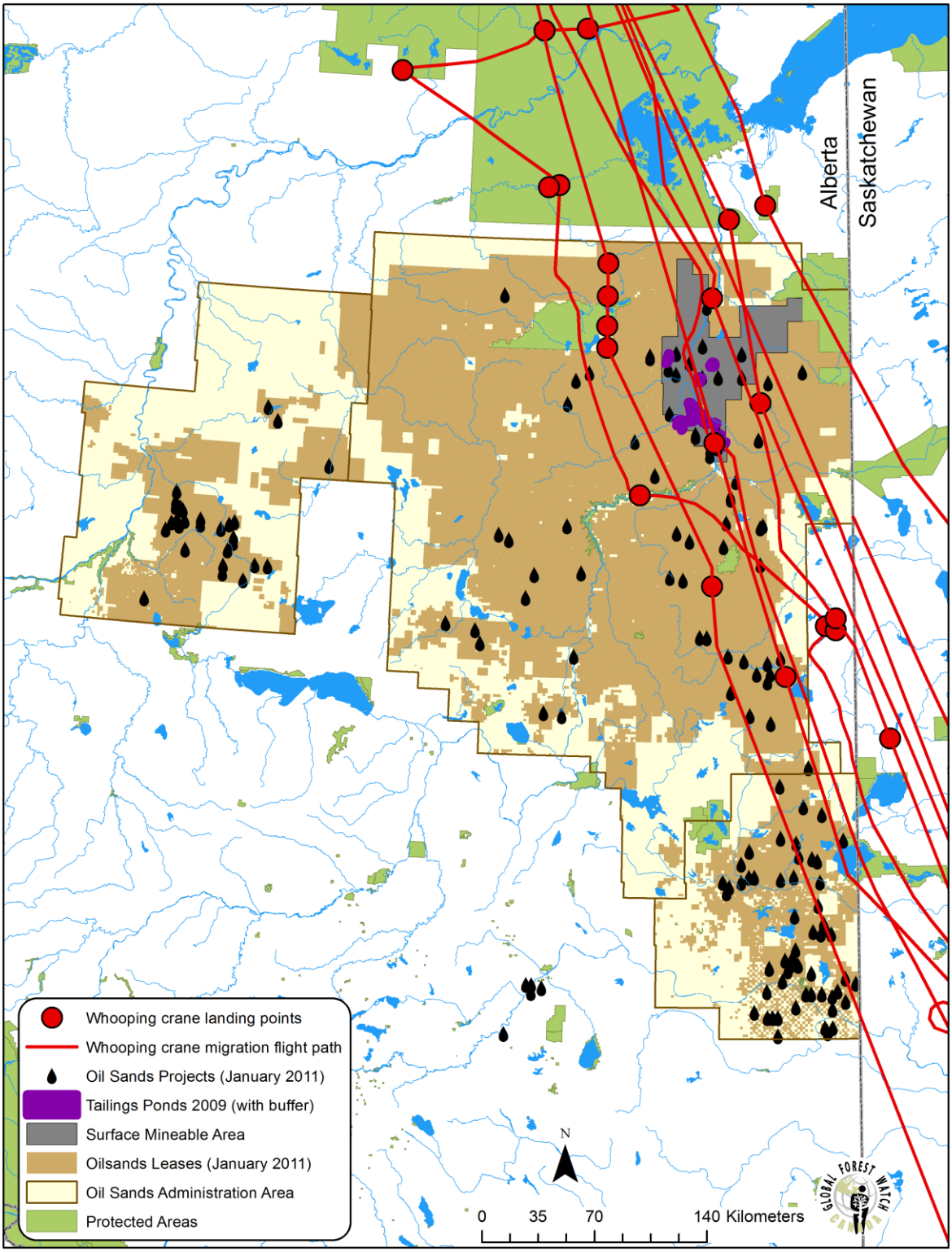
Alberta's bitumen sands industrial developments represent one of the largest energy projects in the world. These are projects on a huge scale, and are increasing rapidly. These developments are within the flight path of migrating whooping cranes. This raises the issue of the extent to which these developments already are or may become a significant threat to whooping cranes. Considering the endangered status of whooping crane and its central place in North American conservation, it is imperative that adequate information about the conservation needs of whooping cranes are dealt with explicitly in land use plans, environmental impact assessments and approvals for industrial developments.



Map 1. Alberta's bitumen sands region in relation to the typical migration path of the whooping crane. (The general migration pathway was delimited by enclosing most of the flight paths of recorded whooping cranes [Kuyt 1992].)



Map 2. Industrial growth in the bituminous sands area of Alberta (Lee et al. 2009).



Map 3. Whooping crane landing points and flight paths in northeastern Alberta for 1981, 1982, and 1983 (Kuyt 1992).

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