

FINAL REPORT

Background Oiling Rate and Historic Beached Bird Deposition Rate Study

Prepared as part of
M/V New Carissa Oil Spill Incident
Natural Resource Damage Assessment Process

Prepared for:

**U. S. Fish and Wildlife Service
Oregon Fish and Wildlife Office**

By:

R. Glenn Ford, Gina K. Himes Boor, and Natalie A. Reed

R.G. FORD CONSULTING COMPANY
2735 N.E. Weidler Street
Portland, Oregon 97232

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INTRODUCTION

In February and March 1999 during the *M/V New Carissa* oil spill (spill or *New Carissa* spill) over 440 oiled birds washed up on Oregon beaches (Ford et al. 2001). Although the number of oiled birds recovered during the spill response was typical for spills of this magnitude (Ford and Reed 2003), oiled birds are occasionally reported along the Oregon coast in the absence of any known oil spill (M. Szumski, USFWS, pers. comm.). These birds are probably killed by waste oil illegally discharged from ships off the Oregon coast. It is therefore possible that some percentage of the birds recovered during the course of the *New Carissa* spill were injured by oil from sources unrelated to the *New Carissa*. The primary goal of this study was to estimate the background oiling rate of seabirds along the same sections of the Oregon coast and at the same time of year as the *New Carissa* oil spill incident. We carried out extensive beach searches and were able to collect a total of 186 beached birds during the course of the study. These beached birds were used to estimate the oiling rate during a year when no major spill incident occurred. In order to assess the comparability of weather conditions during the spill and the study (March of 1999 and 2003 respectively), we analyzed wind data from both time periods. We also examined the background bird deposition rate by comparing the deposition rate during the spill with the deposition rate during the 2003 study for a specific area near Newport.

Another approach to estimating the background bird deposition rate and the oiling rate is to utilize an existing long-term dataset on beached seabirds collected by Bob Loeffel (ODFW, retired). Since 1978, Loeffel has surveyed a segment of coastline near Thiel Creek south of Newport Bay on an approximately weekly basis, recording information on any beached birds recovered in the area. These data provide an exceptional long term record of bird deposition, but cannot be directly compared to the data collected during the spill response because of methodological differences. Seabirds often disappear from the beach face within days after they are deposited (see for example Ford et al. 1996). Since Loeffel surveyed his study area on a weekly cycle, the birds which he recovered had up to 7 days to disappear. During the *New Carissa* response, personnel surveyed many coastal segments on a daily basis so that carcasses were much less likely to disappear between searches. To make these datasets comparable, we coordinated weekly searches of the same segment by Loeffel with daily searches by ODFW personnel who had participated in the *New Carissa* spill response. These data were used to calculate a correction factor relating the recovery rate of beached birds recorded during the *New Carissa* incident to the recovery rate recorded during Loeffel's long term study.

OILING RATE

Beach surveys were conducted between 1 and 21 March 2003 by personnel from R.G. Ford Consulting and the U.S. Fish and Wildlife Service. Most surveys were conducted using all terrain vehicles (ATVs) except for a few short sections of beach that were difficult to traverse by ATV and were searched on foot. Searchers on ATVs worked singly, usually traversing each segment twice, once along the upper wrack line and once along the lower wrack line or wash zone. ATVs are not permitted in the Slusher Lake and Gearhart areas, and surveys of these segments were carried out using a four-wheel drive vehicle with two observers. Surveys were

conducted along the Oregon coast from the south jetty of the Columbia River to the north jetty of Coos Bay (Figure 1).

Beaches were selected based on several factors including the length of beach, information provided by ODFW and USFWS biologists on bird deposition rate, and accessibility to ATVs. To collect as many beached birds as possible, long beaches with relatively easy ATV access were preferred. Most surveys were carried out within beach segments established during the *New Carissa* spill response.

For each bird encountered, searchers recorded the species, level of scavenging, level of oiling, location of oiling, and latitude/longitude coordinates. Each bird was tagged with a unique identification number, photographed, and collected. Identification of birds to species was made using Ainley et. al. (1994) and Hass and Parrish (2000). Carcasses were wrapped in aluminum foil, placed in paper bags, and stored in deep freezers.

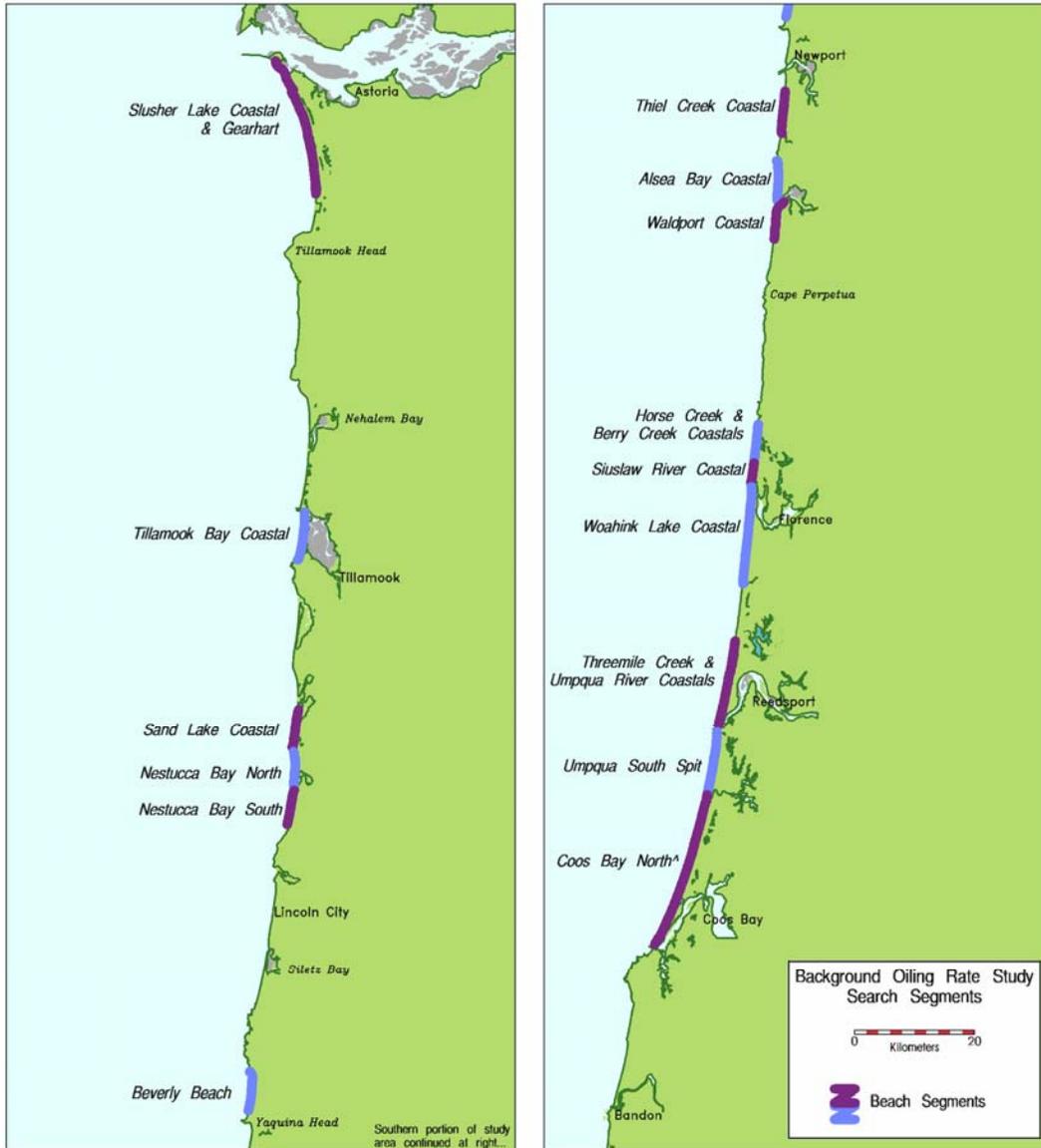
RESULTS

A total of 186 birds were collected between the Coos North Spit search segment in the south and the Slusher Lake and Gearhart search segments in the north. Twenty-two of these birds were found in the Slusher Lake and Gearhart search segments which were not originally considered to be a part of the area affected by the *New Carissa* spill (Ford et. al. 2001).

A total of 17 species were identified. Northern Fulmars were the most commonly recovered species, comprising 23.1% of the total birds collected, and Common Murres were the second most abundant species, comprising 11.3% of the total (Table 1). Most gulls were not identified to species, but gulls as a group accounted for 32.8% of the recoveries. This contrasts with the recoveries during the *New Carissa* incident which were a more even mixture of species dominated by Rhinoceros Auklets (13.9%), gull species (13.1%), and scoters (11.5%).

Of the 186 birds collected during the course of the study, 6 were visibly oiled. Two of the oiled birds, a Northern Fulmar and a Common Murre, were found in the Horse Creek search segment on different days. In the Slusher Lake Coastal and Gearhart search segment, a total of 4 oiled birds were found on one search, two Common Murres, a Cassin's Auklet, and a gull. Six oiled birds out of 186 collected yields an estimated oiling rate of 3.2% (Table 2). By comparison, 33.7% of the birds beached during the *New Carissa* incident (including the Slusher Lake and Gearhart search segments) were recorded as having been oiled. Using a test for equality of percentages (Sokal and Rohlf, 1969) this percentage is significantly higher ($P < 0.001$) than the 3.2% rate found in all search segments during this study.

Figure 1. Oregon coast beach segments searched during the study.



[^] Note: The Coos Bay North segment is composed of five New Carissa search segments, including Tenmile Creek Coastal, Hauser, Horsfall Beach, New Carissa, and Coos North Spit.

Table 1. The number and percentage of each species collected during the study.

Group	Species	Count	Percent
Grebes	Western Grebe	5	2.7%
	Unidentified Grebe	3	1.6%
	Grebe Total	8	4.3%
Procellarids	Northern Fulmar	43	23.1%
	Sooty Shearwater	5	2.7%
	Fork-tailed Storm-Petrel	2	1.1%
	Procellarid Total	50	26.9%
Cormorants	Brandt's Cormorant	3	1.6%
	Cormorant Total	3	1.6%
Scoters	Surf Scoter	4	2.2%
	Unidentified Scoter	2	1.1%
	Scoter Total	6	3.2%
Gulls	Herring Gull	2	1.1%
	Western Gull	4	2.2%
	Glaucous-winged Gull	3	1.6%
	Black-legged Kittiwake	4	2.2%
	Unidentified Gull	48	25.8%
	Gull Total	61	32.8%
Alcids	Common Murre	21	11.3%
	Marbled Murrelet	1	0.5%
	Ancient Murrelet	2	1.1%
	Cassin's Auklet	8	4.3%
	Rhinoceros Auklet	6	3.2%
	Horned Puffin	1	0.5%
	Unidentified Alcid	1	0.5%
Alcid Total	40	18.9%	
Other	American Crow	1	0.5%
	Unidentified Bird	17	9.1%
	Other Total	18	9.7%
Grand Total		186	100%

Table 2. The total number of oiled and unoiled birds found during the study.

Beach Segment	Total Number of Birds Found	Number of Oiled Birds
Slusher Lake Coastal & Gearhart	22	4
Northern Study Area Total	22	4
Tillamook Bay Coastal	6	0
Sand Lake Coastal	4	0
Nestucca Bay North	4	0
Nestucca Bay South	12	0
Beverly Beach	2	0
Thiel Creek Coastal	17	0
Alsea Bay Coastal	6	0
Waldport Coastal	10	0
Horse Creek & Berry Creek Coastals	19	2
Siuslaw River Coastal	13	0
Wohink Lake Coastal	34	0
Threemile Creek & Umpqua River Coastals	7	0
Umpqua South Spit	12	0
Coos Bay North ¹	18	0
Southern Study Area Total	164	2

¹Note: Coos Bay North is a combination of five New Carissa search segments, including Tenmile Creek Coastal, Hauser, Horsfall Beach, New Carissa, and Coos North Spit.

WEATHER CONDITIONS

The response to the *New Carissa* was marked by periods of strong onshore winds, including the gale which caused the bow section to break free while being towed out to sea. Onshore winds were also strong during this study in 2003, though there were no gales quite as intense as the one occurring on March 2, 1999.

Dead or severely injured birds move in the direction of the prevailing wind in a manner similar to spilled oil. Strong onshore winds therefore increase the likelihood that birds will be stranded: other things being equal, higher bird deposition rates will occur during periods of onshore winds. The strength and duration of onshore winds in 1999 and 2003 is therefore a factor influencing the bird deposition rates during these two years.

We used hourly wind data for both 1999 and 2003. Since we are only interested in the onshore component of the wind, we multiplied the wind speed by the negative *sine* of the wind direction.

Thus a 10 kt wind blowing to the east (onshore) would have a value of 10 kt, and a wind blowing to the west (offshore) would have a value of -10 kt. Similarly, a wind blowing to the north or to the south (parallel to the shore) would have a value of zero. A wind blowing to the northeast or southeast (angled onshore) would have a value of 7.1 kt, and a wind blowing to the northwest or southwest would have a value of -7.1 kt. This composite index of windspeed and direction was used by Polaris Applied Sciences and MARZET (2002).

In this analysis, we used wind data from the period 1 February to 31 March 1999, and 1 March to 21 March 2003, downloaded from NOAA buoy 46050 located off Yaquina Bay. The frequency histogram of the onshore component of the windspeed for these periods is shown below. The two distributions are quite similar. The average of the onshore component of the windspeed for 1999 was 2.773 kt, and for 2003 was 3.075 kt, indicating that onshore winds were overall slightly stronger during the study period in 2003 than during the actual incident in 1999. The difference, however, is not statistically significant using either a t-test ($P=0.516$) or a Mann-Whitney rank sum test ($P=0.347$).

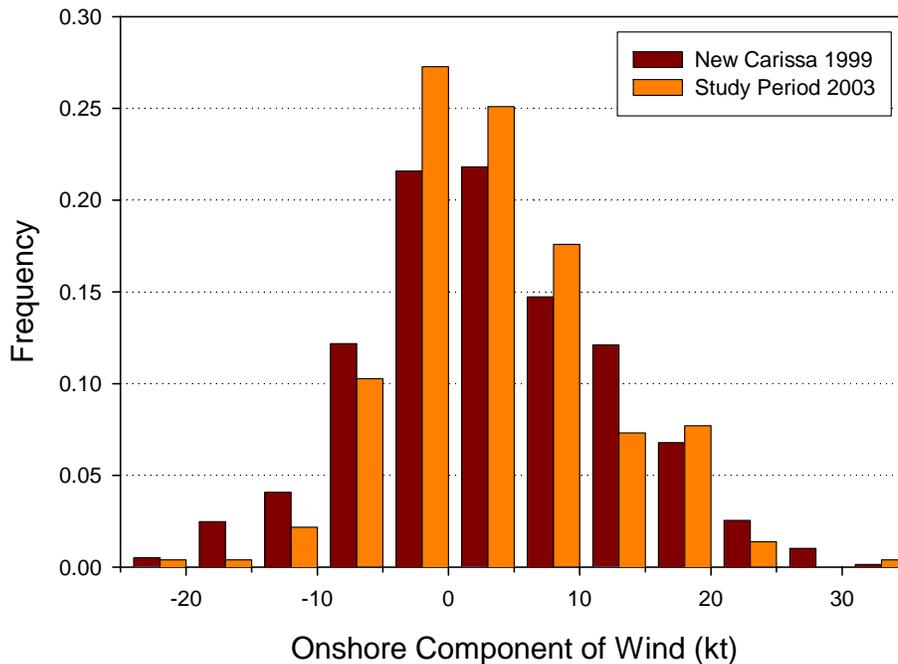


Figure 2. Frequency of the onshore component of the wind in knots. Positive values indicate that the wind is blowing shoreward, negative values indicate that the wind is blowing offshore.

BACKGROUND DEPOSITION RATE

CALIBRATION OF HISTORICAL DATA

During the study period, 1 - 22 March 2003, concurrent beach surveys were conducted by two groups of surveyors, Bob Loeffel and his associates, and ODFW personnel along Loeffel's standard survey route between Beaver Creek and Henderson Creek. ODFW personnel conducted surveys on week days, while Loeffel's team generally conducted surveys on the weekends. All surveys were carried out on foot. ODFW personnel searched the study area using the same searching technique and style that was used during the *New Carissa* spill response (Ford et. al. 2001). Loeffel's team followed the same searching protocol and techniques regularly employed on Loeffel's standard surveys .

To prevent the activities of the two sets of survey teams from interfering with each other, birds were not initially collected or removed from the beach by either group, but rather were marked and left in place on the beach. Each bird encountered by ODFW personnel was marked with a small numbered yellow or blue band. The band number for each bird was recorded, along with the species, scavenging level, presence of oiling, and latitude/longitude position. Loeffel's team recorded similar information for each bird encountered, but marked their birds with a green or red numbered band. When a marked bird had been found by both groups, it was recorded, identified as a bird found by both groups, and removed from the beach.

Deposition rate is defined as the total number of birds found on a section of beach divided by the total number of kilometers searched. For Loeffel's surveys, a weekly deposition rate was calculated using data collected on the first day of the weekly surveys. This deposition rate is comparable to rates based on his weekly surveys over the past 25 years.

The daily deposition rate from the ODFW surveys was calculated using data from the second through fifth days of each five day period. The first day of each period was excluded because birds found on that day included the accumulation of birds deposited since the last search three days earlier. The deposition rate was calculated as the total number of birds recovered over the remaining four days divided by the length of the area searched over that period -- i.e. four times the length of the segment. Birds that were found by both Loeffel's group and by ODFW personnel were included in the calculation of both Loeffel's weekly and ODFW's daily deposition rates.

Using data collected by Loeffel's team, we calculated a deposition rate of 0.27 birds per kilometer per week. The comparable rate for the data collected by ODFW personnel, was 0.07 birds per kilometer per day. Dividing Loeffel's rate by the ODFW daily rate yields a conversion factor of 3.86. Applied to Loeffel's historical dataset, this conversion factor can be used to estimate the background daily deposition rate. The average deposition rate during February and March recorded in Loeffel's long term dataset is 0.52 birds/km. The correction factor of 3.86 applied to this value yields a corrected daily deposition rate during February and March of 0.135 birds per kilometer of searched beach. This value is well within the 0.1 to 0.2 birds per kilometer range estimated in the *New Carissa* damage assessment report, and is similar to the 0.15 birds per kilometer rate used for the Beached Bird Model calculations (Ford et al. 2001).

DIRECT COMPARISON OF DEPOSITION RATES IN 1999 AND 2003

We also compared deposition rates during the study with deposition rates in the same area during the spill response. Records of the beached bird searches in the area from Beaver Creek to Henderson Creek (segments A3 and A4) during the spill incident (March 1999) were compiled; records were included only if effort was recorded on search and collection forms, and birds reported on those forms could be located in the morgue database. Two measures were calculated: birds per kilometer per day for each day in March, and cumulative number of birds found for each day after the initial day of search. The results were compared with the same measures calculated for the study period, March 2003 (Figures 3 and 4).

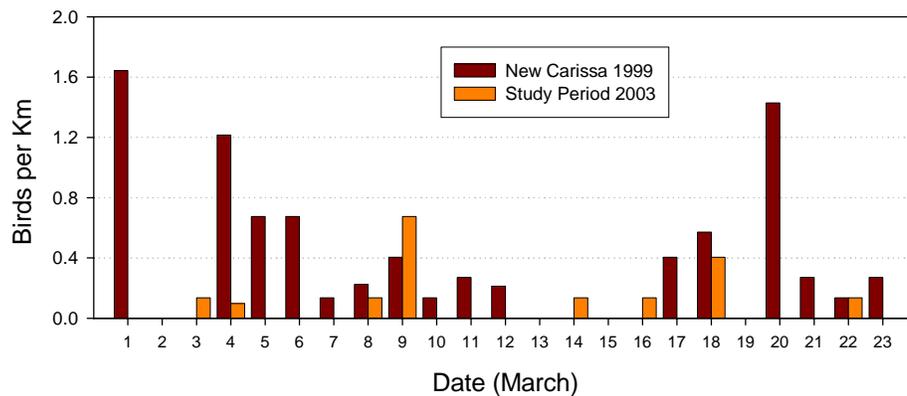


Figure 3. Deposition rate (birds per kilometer per day) during March 1999 and March 2003 on study area beaches. First-day searches were excluded. No beaches were surveyed on March 2.

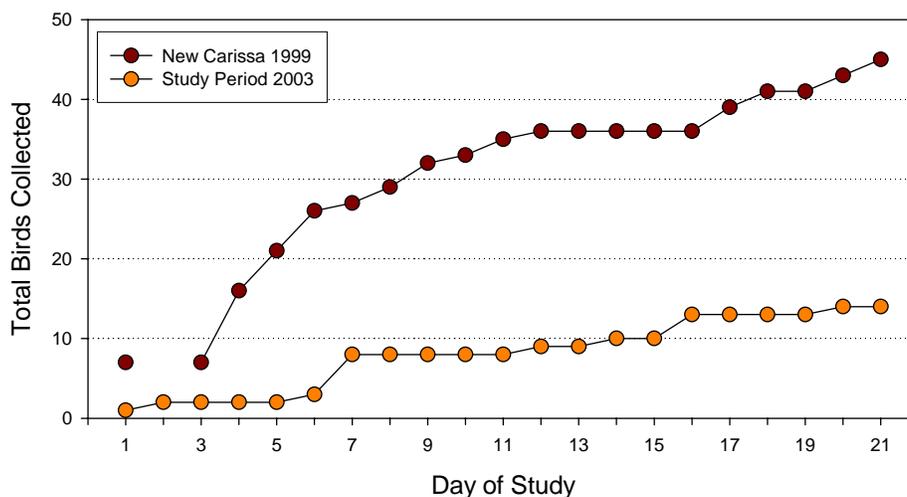


Figure 4. Cumulative number of birds found during comparable 21-day periods in March. Beaches were not searched on day 2 of the *New Carissa* dataset.

Both figures 3 and 4 show a deposition rate 3 to 4 times as great during the *New Carissa* event compared to the 2003 study. A total of 45 birds were recovered in Loeffel's study area during the *New Carissa* incident as compared to a total of 14 birds in the same area during the 2003 study. Over the period March 1-21, 3.2 times as many birds were recovered in 1999 as compared to 2003.

SUMMARY

In 2003, studies relating to the deposition of dead birds were carried out along the Oregon coast in areas that had been affected by the *New Carissa* spill. The studies took place during the same time of year as the spill incident itself. An analysis of the onshore component of the winds indicated that onshore winds were slightly stronger during the 2003 study than during the 1999 spill response. The purpose of the studies was twofold:

- Estimate the frequency of detectable oiling among beached birds during a non-spill year in order to estimate the background oiling rate. This provides insight as to the likely importance of oil sources other than the *New Carissa* in relation to bird injury resulting from the incident.
- Calibrate the methodology used by Bob Loeffel in his long term study of beached birds with the methodology used by spill response personnel during the *New Carissa* incident. This provides an estimate of the carcass deposition rate that would occur in the absence of an ongoing incident such as the *New Carissa*.

A total of 186 birds were recovered during the course of this study. Six of these birds were observed to be oiled, for an overall oiling rate of 3.2%. The oiling rate observed during the *New Carissa* spill was 33.7%, more than ten times higher than during these studies. The oiling rate observed during the *New Carissa* incident is significantly higher ($P < 0.001$) than that observed during these studies.

The weekly search schedule used by Bob Loeffel and his team resulted in more birds being recovered on a given day of search than the daily schedule used by ODFW personnel who were simulating the searches carried out during the *New Carissa* incident. Along the identical stretch of coastline, Loeffel's team recovered 3.86 times as many birds per day of search as ODFW personnel.

Applied to Loeffel's historical dataset, this conversion factor can be used to estimate the background daily deposition rate. The average deposition rate during February and March recorded in Loeffel's long term dataset is 0.52 birds/km. The correction factor of 3.86 applied to this value yields a corrected daily deposition rate during February and March of 0.135 birds per kilometer of searched beach. This value is well within the 0.1 to 0.2 birds per kilometer range estimated in the *New Carissa* damage assessment report, and is similar to the 0.15 birds per kilometer rate used for the Beached Bird Model calculations (Ford et al. 2001).

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