

## Allocating “Unidentified” Birds to Species for Purposes of Translating Shoreline Deposition Model and “Excluded Regions” Mortality Estimates into Species-Specific Injury Quantifications

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As part of the natural resource damage assessment (NRDA) for the *Deepwater Horizon* / Mississippi Canyon 252 oil spill, the Department of the Interior compiled information on the dead and live, debilitated birds collected by NRDA teams and wildlife response teams during the oil spill. This “DWH Collected Birds Dataset” contains information such as the species identification of the bird, the date and location of bird collection, and several other data fields. However, the DWH Collected Birds Dataset contains many records of birds that were not identified to species, for reasons such as, but not limited to, the collector of the bird could not identify its specific species or the collector refrained from entering data into this data field on a datasheet. There are two categories of “unidentified” bird records: birds that were classified to Genus or guild (e.g., labeled “Gull; unidentified” in the “Species” data field of the Dataset) and birds for which the identity is completely unknown (labeled “Unknown” in the “Species” data field). In total, the DWH Collected Birds Dataset<sup>1</sup> contains 8,905 records for 150 species/guild categories. Of the 150 species/guild categories, and considering just those bird records that were used in the Shoreline Deposition Model<sup>2</sup>, 24 categories are “unidentified” species/guild categories and one is an entirely “unknown” category (Table 1).

During the verification and validation of the DWH Collected Birds Dataset, biologists with avian expertise evaluated some photographs of the collected birds in an effort to reclassify, if possible, bird records with unidentified species to more specific species or Genus/guild descriptions. Biologists were unable to reclassify all “unidentified” records evaluated based on information obtained from photographs. In addition, a systematic review of all photographs for all records was not performed due to limitations on the time available for verification and validation. Therefore, several records of “unidentified” birds remain in the DWH Collected Birds Dataset.

The DWH Collected Birds Dataset, including the “unidentified” categories, was used as one of the major data sources in the Department’s avian Shoreline Deposition Model which estimated a portion of the avian mortality occurring in the nearshore area of the northern Gulf of Mexico from the beginning of the spill to September 30, 2010 (IEC 2015). The output of the Shoreline Deposition Model is in terms of generic “birds,” without regard to species. The output can be allocated to species by prorating the Model’s output according to the proportions of the species and/or guild categories in the Model’s input (i.e., the DWH Collected Birds Dataset). However, the DWH Collected Birds Dataset contains several records of birds that were not identified to species. The methodology described in this document resolves this issue.

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<sup>1</sup> DWHBirdsCollected\_DraftValidated\_8.6.15.xlsx

<sup>2</sup> The DWH Birds Collected Dataset contains a data field that identifies whether a record was “Included” or “Excluded” as inputs to the Shoreline Deposition Model.

Bird mortality in a few regions of the northern Gulf of Mexico could not be addressed by the Shoreline Deposition Model due to insufficient search effort data. Mortality in these “Excluded Regions” was estimated by extrapolating certain output information from the Shoreline Deposition Model (USFWS 2015). Thus, the “Excluded Regions” method also uses the DWH Collected Birds Dataset as a major input, although indirectly, and generates mortality output in terms of generic “birds.” The output can be allocated to species using the same procedure as for the Shoreline Deposition Model.

Another need for allocating injury outputs to species regards the Department’s approach to scaling restoration benefits to the magnitude of injury. The Department’s scaling models use species-specific life history parameters such as annual survival rates and productivity. The “unidentified” Genus/guild categories and “Unknown” categories present unnecessary burdens when compiling appropriate life history information for scaling.

The Department used the three-step methodology described below to identify the prorating values that were used to translate the output of the Shoreline Deposition Model and Excluded Regions method into species-specific injury estimates. In general, “unidentified” records were allocated to specific species according to the bird records in the DWH Collected Birds Dataset with known species identities and the proportions in which those specific species occur in the Dataset. The final proportions of each species, after all “unidentified” categories have been resolved, are then used at the pro-rating values to translate total bird injury values from the Shoreline Deposition Model into species specific injury quantification.

It should be noted that the validation of the DWH Collected Birds Dataset was completed prior to, and is separate from, the implementation of this methodology, and no records in the DWH Collected Birds Dataset were altered as part of this allocation process. This methodology generates prorating values, using DWH Collected Birds Dataset information, with which to transform the mortality estimates from the Shoreline Deposition Model and the Excluded Regions method into species-specific quantifications.

#### Step 1: Allocating “Unidentified” Genus/guilds to Species

For purposes of this methodology, the Department used a working assumption that the true species identity for any “unidentified” records is most likely one of the species that is already specifically listed in the DWH Collected Birds Dataset. Therefore, for each of the “unidentified” categories, the DWH Collected Birds Dataset, filtered to exclude all bird records not used in the Shoreline Deposition Model<sup>3</sup>, was consulted to generate a list of the specific species that could be covered by the “unidentified” category (Table 2), primarily considering similarities in body size and shape, and secondarily considering coloring, from the perspective of a novice birdwatcher. Typical behaviors and ecological niche were generally not relevant in this process, and the process did not strictly adhere to taxonomic classification hierarchy. For example, when developing the list of potential species covered by “Shorebird; Unidentified,” we identified species that are relatively small in size, with relatively short legs, and brown-ish coloration over

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<sup>3</sup> In the DWH Collected Birds Dataset, there is data field labeled “Included/ Excluded” that facilitates the identification of birds that were used in the Shoreline Deposition Model. Any birds marked “Excluded” for any reason were not used in the methodology for allocating to species.

most of the adult bird, generally resembling a sanderling. Plover and sandpiper species were included in this group, due to their similar size, body shape, and coloring. However, the willet was not included as a potential for “Shorebird; Unidentified,” due to its significantly larger size, even though the willet belongs to the same taxonomic Family (Scolopacidae) as sanderling and sandpiper species.

Considering just the group of potential species covered by an “unidentified” category, the proportions of those species within the group were used to assign the “unidentified” records to specific species. For example, only two species of pelicans (Genus *Pelecanus*) are specifically listed in the DWH Collected Birds Dataset: brown pelicans (*Pelecanus occidentalis*) and American white pelicans (*Pelecanus erythrorhynchos*). Of the records (filtered to exclude birds not used in the Shoreline Deposition Model) identified to a specific pelican species, 97% are brown pelicans and 3% are American white pelicans. Using the assumption that any record of “Pelican; Unidentified” must be one of those specific pelican species, the “Pelican; Unidentified” records were apportioned so that 97% became brown pelicans and 3% became American white pelicans, rounding the allocations to whole numbers of birds.

However, in some instances, a pure calculation of proportions was insufficient to allocate all “unidentified” records to species. Allocations should be made using whole numbers, but calculated proportions sometimes resulted in allocations of fractions of birds. If the fractions were rounded to the nearest whole number, the sum of the whole numbers was not equal to the number of “unidentified” records that needed distributing. “Duck; Unidentified” is an example (Table 2). In order to complete the allocation objectively, the list of proposed specific species in the group used for the prorating calculation was reduced to eliminate the specific species with the lowest number of records. This reduction process was conducted iteratively until all “unidentified” records could be allocated.

The category “Yellowlegs; Unidentified” was an exception to step 1. There were no specific yellowlegs species listed in the DWH Collected Birds Dataset, so this “unidentified” category remained as is.

The records from the “Egret; Unidentified” and “Heron; Unidentified” categories were allocated together using a single group of egret and heron species combined. This was done due to the body size and shape similarities of the two categories to the novice bird observer.

## Step 2: Allocating “Unknown” birds to Species

There were 327 “Unknown” records that needed allocating to specific species in the dataset used in this prorating methodology. In concept, Step 2 used the general process described in Step 1, but the process was applied to the “Unknown” category, using proportions from all of the other specific species categories, including the resolved records from Step 1. After all of the “unidentified” categories were resolved, the list of species assessed by the Shoreline Deposition Model had been reduced to 119 specific species (Table 3).

### Step 3: Calculate the final Prorating Values

Finally, using the list of 119 specific species and the adjusted numbers of records per species, the resulting proportions of the known species (Table 4) were used as the final prorating values to translate the non-species-specific mortality estimates from the Shoreline Deposition Model and the “Excluded Regions method” into a species-specific quantifications. Table 5 provides the same information as Table 4 but in order of greatest proportion to lowest.

Table 1: Comprehensive list of species / guilds categories from the DWH Collected Birds Dataset (Dead and Live), considering only bird records included in the Shoreline Deposition Model, before distribution of "unidentified" records (which are shown in yellow highlight).

American Coot	Common Tern	Killdeer
American Oystercatcher	Common Yellowthroat	Laughing Gull
American Redstart	Cooper's Hawk	Leach's Storm-Petrel
American White Pelican	Cormorant; Unidentified	Least Bittern
Audubon's Shearwater	Cory's Shearwater	Least Sandpiper
Baltimore Oriole	Double-crested Cormorant	Least Tern
Barn Owl	Dowitcher; Unidentified	Lesser Black-backed Gull
Barn Swallow	Duck; Unidentified	Lesser Scaup
Barred Owl	Dunlin	Little Blue Heron
Belted Kingfisher	Eastern Kingbird	Long-Billed Dowitcher
Black Skimmer	Eastern Meadowlark	Loon; Unidentified
Black Tern	Eastern Screech-Owl	Magnificent Frigatebird
Black-bellied Plover	Egret; Unidentified	Mallard
Black-Bellied Whistling-Duck	Eurasian Collared-Dove	Manx Shearwater
Black-crowned Night-heron	European Starling	Masked Booby
Black-necked Stilt	Flycatcher; Unidentified	Mottled Duck
Blue-winged Teal	Forster's Tern	Mourning Dove
Boat-tailed Grackle	Fulvous Whistling-Duck	Muscovy Duck
Bobolink	Glossy Ibis	Neotropic Cormorant
Bridled Tern	Great Blue Heron	Night-Heron; Unidentified
Broad-Winged Hawk	Great Crested Flycatcher	Northern Cardinal
Brown Noddy	Great Egret	Northern Gannet
Brown Pelican	Great Egret	Northern Mockingbird
Brown Thrasher	Great Horned Owl	Osprey
Brown-headed Cowbird	Great Shearwater	Passerine; Unidentified
Bufflehead	Grebe; Unidentified	Pelican; Unidentified
Canada Goose	Green Heron	Pied-billed Grebe
Carolina Wren	Green-winged Teal	Purple Gallinule
Caspian Tern	Gull; Unidentified	Purple Martin
Cattle Egret	Gull-billed Tern	Rail; Unidentified
Chimney Swift	Heron; Unidentified	Raptor; Unidentified
Clapper Rail	Herring Gull	Red-Breasted Merganser
Common Gallinule	House Finch	Reddish Egret
Common Loon	House Sparrow	Red-shouldered Hawk

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Table 1 (cont.)

Red-tailed Hawk	Semipalmated Sandpiper	Tern; Unidentified
Red-winged Blackbird	Shearwater; Unidentified	Tricolored Heron
Ring-billed Gull	Shorebird; Unidentified	Unknown
Rock Pigeon	Short-billed Dowitcher	Virginia Rail
Roseate Spoonbill	Snowy Egret	Wading Bird; Unidentified
Rose-breasted Grosbeak	Sooty Shearwater	Warbler; Unidentified
Royal Tern	Sooty Tern	White Ibis
Ruddy Duck	Sora	White-tailed Tropicbird
Ruddy Turnstone	Sparrow; Unidentified	White-winged Dove
Sanderling	Spotted Sandpiper	Willet
Sandpiper; Unidentified	Surf Scoter	Wilson's Plover
Sandwich Tern	Swallow; Unidentified	Yellow-billed Cuckoo
Seaside Sparrow	Teal; Unidentified	Yellow-crowned Night-Heron
		Yellowlegs; Unidentified

Table 2: Groups of potential specific species included under each “Unidentified” Genus/guild category, proportions of each species within the group, and calculated allocations of “unidentified” records to species.

"Unidentified" Category	Record Count in Filtered DWH Collected Birds Dataset	Relevant Specific Species	Record Count in Filtered DWH Collected Birds Dataset	% of group	Calculated allocation	"Unidentified" records (whole number) getting allocated to species:
Cormorant; Unidentified	7	Double-crested Cormorant	44	1.000	7	7
		total of group	44		7	7
Dowitcher; Unidentified	1	Long-Billed Dowitcher	1	0.333	0.33	
		Short-billed Dowitcher	2	0.667	0.67	1
		total of group	3		1	1
Duck; Unidentified	11	Black-Bellied Whistling-Duck*	2		0	
		Blue-winged Teal	12	0.279	3.07	3
		Bufflehead*	1		0	
		Fulvous Whistling-Duck*	1		0	
		Green-winged Teal*	2		0	
		Lesser Scaup*	1		0	
		Mallard	24	0.558	6.14	6
		Mottled Duck	7	0.163	1.79	2
		Muscovy Duck*	2		0	
		Red-Breasted Merganser*	2		0	
		Ruddy Duck*	2		0	
		Surf Scoter*	3		0	
		total of group	43		11	11

\*not included in calculation

Egret; Unidentified	8	Cattle Egret	44	0.221	5	5
Heron; Unidentified	9	Great Blue Heron	55	0.276	6.1	6
*not included in calculation		Great Egret	3	0.015	2.9	3
		Green Heron*	17		0	
		Least Bittern*	5		0	
		Little Blue Heron*	5		0	
		Reddish Egret*	4		0	
		Snowy Egret	24	0.121	2.6	3
		Tricolored Heron	42	0.211	4.4	4
		total of group	199		21	21
Flycatcher; Unidentified	1	Great Crested Flycatcher	1	1.000	1	1
		total of group	1			1
Grebe; Unidentified	3	Pied-billed Grebe	34	1.000	3	3
		total of group	34			3
Gull; Unidentified	86	Herring Gull	29	0.008	0.7	1
		Laughing Gull	3541	0.990	85.2	85
		Lesser Black-backed Gull	4	0.001	0.1	
		Ring-billed Gull	3	0.001	0.1	
		total of group	3577		86	86
Loon; Unidentified	4	Common Loon	78	1.000	4	4
		total of group	78			4

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Night-Heron; Unidentified	5	Black-crowned Night-heron	18	0.692	3.4	3
		Yellow-crowned Night-Heron	8	0.308	1.6	2
		total of group	26			5
Passerine; Unidentified	36	American Redstart*	1		0	
		Baltimore Oriole*	1		0	
		Barn Swallow*	1		0	
		Boat-tailed Grackle*	1		0	
		Bobolink*	1		0	
		Brown-headed Cowbird*	1		0	
		Brown Thrasher*	2		0	
		Carolina Wren*	1		0	
		Common Yellowthroat*	2		0	
		Eastern Kingbird*	1		0	
		Eastern Meadowlark*	1		0	
		European Starling*	3		0	
		Great Crested Flycatcher*	1		0	
		House Finch*	1		0	
		House Sparrow*	2		0	
		Northern Cardinal*	3		0	
		Northern Mockingbird	8	0.533	19.2	20
		Purple Martin	7	0.467	16.8	17
		Red-winged Blackbird*	1		0	
		Rose-breasted Grosbeak*	3		0	
		Seaside Sparrow*	1		0	
		total of group	15		37	37
Pelican; Unidentified	1	American White Pelican	44	0.032	0.03	



		Brown Pelican	1311	0.968	0.97	1
		total of group	1355		1	1
Rail; Unidentified	7	Clapper Rail	57	0.950	6.65	7
		Sora	3	0.050	0.35	
		Virginia Rail*	1		0	
		total of group	60		7	7
Raptor; Unidentified	3	Broad-Winged Hawk*	1		0	
		Cooper's Hawk*	1		0	
		Osprey	10	1.000	3	3
		Red-shouldered Hawk*	1		0	
		Red-tailed Hawk*	1		0	
		total of group	10		3	3
Sandpiper; Unidentified	1	Least Sandpiper	1	0.029	0.03	
		Sanderling	28	0.824	0.82	1
		Semipalmated Sandpiper	4	0.118	0.12	
		Spotted Sandpiper	1	0.029	0.03	
		total of group	34		1	1
Shearwater; Unidentified	6	Audubon's Shearwater	4	0.143	0.86	1
		Cory's Shearwater	2	0.071	0.43	1
		Great Shearwater	20	0.714	4.29	4
		Manx Shearwater	1	0.036	0.21	
		Sooty Shearwater	1	0.036	0.21	
		total of group	28		6	6

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Shorebird; Unidentified	2	Black-bellied Plover	1	0.016	0.03	
		Dunlin	2	0.031	0.06	
		Killdeer	4	0.063	0.13	
		Least Sandpiper	1	0.016	0.03	
		Long-Billed Dowitcher	1	0.016	0.03	
		Piping Plover	1	0.016	0.03	
		Ruddy Turnstone	15	0.234	0.47	1
		Sanderling	28	0.438	0.88	1
		Semipalmated Sandpiper	4	0.063	0.13	
		Short-billed Dowitcher	2	0.031	0.06	
		Spotted Sandpiper	1	0.016	0.03	
		Wilson's Plover	3	0.047	0.09	
		Yellowlegs; Unidentified	1	0.016	0.03	
		total of group	64		2	2
Sparrow; Unidentified	3	House Finch*	1		0	
		House Sparrow	2	1.000	3	3
		Seaside Sparrow*	1		0	
		total of group	2		3	3
Swallow; Unidentified	2	Barn Swallow	1	0.125	0.25	
		Purple Martin	7	0.875	1.75	2
		total of group	8		2	2
Teal; Unidentified	1	Blue-winged Teal	12	0.857	0.86	1
		Green-winged Teal	2	0.143	0.14	
		total of group	14		1	1

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Tern; Unidentified	81	Black Tern*	9			
		Bridled Tern*	2			
		Brown Noddy*	1			
		*not included in calculation	Caspian Tern*	22		
		Common Tern*	31			
		Forster's Tern	44	0.078	6.32	6
		Gull-billed Tern*	5			
		Least Tern	104	0.184	14.94	15
		Royal Tern	333	0.590	47.82	48
		Sandwich Tern	83	0.147	11.92	12
		Sooty Tern*	3			
		total of group	564		81	81
Wading Bird; Unidentified	4	Black-crowned Night-heron	18	0.063	0.25	
		Black-necked Stilt	3	0.010	0.04	
		Cattle Egret	44	0.153	0.61	1
		*not included in calculation	Glossy Ibis	1	0.003	0.01
		Great Blue Heron	55	0.192	0.77	1
		Great Egret	3	0.010	0.04	
		Green Heron	17	0.059	0.24	
		Least Bittern	5	0.017	0.07	
		Little Blue Heron	5	0.017	0.07	
		Reddish Egret	4	0.014	0.06	
		Roseate Spoonbill	39	0.136	0.54	1
		Snowy Egret	24	0.084	0.33	
		Tricolored Heron	42	0.146	0.59	1
		White Ibis	7	0.024	0.10	
		Willet	11	0.038	0.15	
		Yellow-crowned Night-Heron	8	0.028	0.11	
		Yellowlegs; Unidentified	1	0.003	0.01	
		total of group	287		4	4

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Warbler; Unidentified	2	American Redstart	1	0.333	0.67	1
		Common Yellowthroat	2	0.667	1.33	1
		total of group	3		2	2

Yellowlegs, Unidentified	1
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Keep as is, as there were no species-specific yellowlegs collections made.

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Table 3: Allocating “Unknown” records to species. Species marked with an asterisk were not used in the calculation in order to facilitate the allocation of whole numbers of bird records.

	Total (DEAD & LIVE) + allocations from “Unidentified” Genus/guild categories	% of species used in calculation	Calculated allocation	Allocation (whole numbers) of “Unknown” to each species
American Coot*	3			
American Oystercatcher	13	0.0018	0.5960	1
American Redstart*	1			
American White Pelican	44	0.0062	2.0171	2
Audubon's Shearwater	5			
Baltimore Oriole*	1			
Barn Owl*	1			
Barn Swallow*	1			
Barred Owl*	1			
Belted Kingfisher*	1			
Black Skimmer	187	0.0262	8.5727	9
Black Tern*	9			
Black-bellied Plover*	1			
Black-Bellied Whistling-Duck*	2			
Black-crowned Night-heron	21	0.0029	0.9627	1
Black-necked Stilt*	3			
Blue-winged Teal	15	0.0021	0.6876	1
Boat-tailed Grackle*	1			
Bobolink*	1			
Bridled Tern*	2			
Broad-Winged Hawk*	1			
Brown Noddy*	1			
Brown Pelican	1312	0.1839	60.1464	60
Brown-headed Cowbird*	1			
Bufflehead*	1			
Brown Thrasher*	2			
Canada Goose*	2			
Carolina Wren*	1			
Caspian Tern	22	0.0031	1.0086	1
Cattle Egret	49	0.0069	2.2463	2
Chimney Swift*	3			
Clapper Rail	64	0.0090	2.9340	3
Common Gallinule*	3			
Common Loon	82	0.0115	3.7591	4
Common Tern	31	0.0043	1.4211	1
Common Yellowthroat*	2			
Cooper's Hawk*	1			

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Cory's Shearwater*	2			
Double-crested Cormorant	51	0.0071	2.3380	2
Dunlin*	2			
Eastern Kingbird*	1			
Eastern Meadowlark*	1			
Eastern Screech-Owl*	1			
Eurasian Collared-Dove*	4			
European Starling*	3			
Forster's Tern	50	0.0070	2.2922	2
Fulvous Whistling-Duck*	1			
Glossy Ibis*	1			
Great Blue Heron	61	0.0086	2.7964	3
Great Crested Flycatcher*	2			
Great Egret	20	0.0028	0.9169	1
Great Horned Owl*	1			
Great Shearwater	24	0.0034	1.1002	1
Green Heron	17	0.0024	0.7793	1
Green-winged Teal*	2			
Gull-billed Tern*	5			
Herring Gull	30	0.0042	1.3753	1
House Finch*	1			
House Sparrow*	2			
Killdeer*	4			
Laughing Gull	3626	0.5083	166.2277	166
Leach's Storm-Petrel*	2			
Least Bittern*	5			
Least Sandpiper*	1			
Least Tern	119	0.0167	5.4553	5
Lesser Black-backed Gull*	4			
Lesser Scaup*	1			
Little Blue Heron*	5			
Long-Billed Dowitcher*	1			
Magnificent Frigatebird	13	0.0018	0.5960	1
Mallard	30	0.0042	1.3753	1
Manx Shearwater*	1			
Masked Booby*	8			
Mottled Duck*	9			
Mourning Dove	16	0.0022	0.7335	1
Muscovy Duck*	2			
Neotropic Cormorant*	2			
Northern Cardinal*	3			
Northern Gannet	467	0.0655	21.4088	21
Northern Mockingbird	27	0.0038	1.2378	1

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Osprey	13	0.0018	0.5960	1
Pied-billed Grebe	37	0.0052	1.6962	2
Piping Plover*	4			
Purple Gallinule*	3			
Purple Martin	24	0.0034	1.1002	1
Red-Breasted Merganser*	2			
Reddish Egret*	4			
Red-shouldered Hawk*	1			
Red-tailed Hawk*	1			
Red-winged Blackbird*	1			
Ring-billed Gull*	3			
Rock Pigeon	40	0.0056	1.8337	2
Roseate Spoonbill	40	0.0056	1.8337	2
Rose-breasted Grosbeak*	3			
Royal Tern	381	0.0534	17.4663	17
Ruddy Duck*	2			
Ruddy Turnstone	15	0.0021	0.6876	1
Sanderling	29	0.0041	1.3295	1
Sandwich Tern	95	0.0133	4.3551	4
Seaside Sparrow*	1			
Semipalmated Sandpiper*	4			
Short-billed Dowitcher*	3			
Snowy Egret	27	0.0038	1.2378	1
Sooty Shearwater*	1			
Sooty Tern*	3			
Sora*	3			
Spotted Sandpiper*	1			
Surf Scoter*	3			
Tricolored Heron	46	0.0064	2.1088	2
Unknown	327			
Virginia Rail*	1			
White Ibis*	7			
White-tailed Tropicbird*	1			
White-winged Dove*	1			
Willet	11	0.0015	0.5043	1
Wilson's Plover*	3			
Yellow-billed Cuckoo*	2			
Yellow-crowned Night-Heron*	10			
Yellowlegs; Unidentified*	1			
total all		7673	1.00000	327
total "Unknown"		327		
total "knowns" used in calc		7133		

Table 4: Final list of impacted species used in the prorating methodology and final prorating values for translating Shoreline Deposition Model mortality estimates into species-specific injury quantifications.

	Total (DEAD & LIVE) after resolving all "unidentified" Genus/guilds and "Unknown"	Final prorating value for translation (% of total)
American Coot	3	0.0004
American Oystercatcher	14	0.0018
American Redstart	1	0.0001
American White Pelican	46	0.0060
Audubon's Shearwater	5	0.0007
Baltimore Oriole	1	0.0001
Barn Owl	1	0.0001
Barn Swallow	1	0.0001
Barred Owl	1	0.0001
Belted Kingfisher	1	0.0001
Black Skimmer	196	0.0255
Black Tern	9	0.0012
Black-bellied Plover	1	0.0001
Black-Bellied Whistling-Duck	2	0.0003
Black-crowned Night-heron	22	0.0029
Black-necked Stilt	3	0.0004
Blue-winged Teal	16	0.0021
Boat-tailed Grackle	1	0.0001
Bobolink	1	0.0001
Bridled Tern	2	0.0003
Broad-Winged Hawk	1	0.0001
Brown Noddy	1	0.0001
Brown Pelican	1372	0.1788
Brown-headed Cowbird	1	0.0001
Brown Thrasher	1	0.0001
Bufflehead	2	0.0003
Canada Goose	2	0.0003
Carolina Wren	1	0.0001
Caspian Tern	23	0.0030
Cattle Egret	51	0.0066
Chimney Swift	3	0.0004
Clapper Rail	67	0.0087
Common Gallinule	3	0.0004
Common Loon	86	0.0112
Common Tern	32	0.0042
Common Yellowthroat	2	0.0003



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Cooper's Hawk	1	0.0001
Cory's Shearwater	2	0.0003
Double-crested Cormorant	53	0.0069
Dunlin	2	0.0003
Eastern Kingbird	1	0.0001
Eastern Meadowlark	1	0.0001
Eastern Screech-Owl	1	0.0001
Eurasian Collared-Dove	4	0.0005
European Starling	3	0.0004
Forster's Tern	52	0.0068
Fulvous Whistling-Duck	1	0.0001
Glossy Ibis	1	0.0001
Great Blue Heron	64	0.0083
Great Crested Flycatcher	2	0.0003
Great Egret	21	0.0027
Great Horned Owl	1	0.0001
Great Shearwater	25	0.0033
Green Heron	18	0.0023
Green-winged Teal	2	0.0003
Gull-billed Tern	5	0.0007
Herring Gull	31	0.0040
House Finch	1	0.0001
House Sparrow	2	0.0003
Killdeer	4	0.0005
Laughing Gull	3792	0.4943
Leach's Storm-Petrel	2	0.0003
Least Bittern	5	0.0007
Least Sandpiper	1	0.0001
Least Tern	124	0.0162
Lesser Black-backed Gull	4	0.0005
Lesser Scaup	1	0.0001
Little Blue Heron	5	0.0007
Long-Billed Dowitcher	1	0.0001
Magnificent Frigatebird	14	0.0018
Mallard	31	0.0040
Manx Shearwater	1	0.0001
Masked Booby	8	0.0010
Mottled Duck	9	0.0012
Mourning Dove	17	0.0022
Muscovy Duck	2	0.0003
Neotropic Cormorant	2	0.0003
Northern Cardinal	3	0.0004
Northern Gannet	488	0.0636

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Northern Mockingbird	28	0.0036
Osprey	14	0.0018
Pied-billed Grebe	39	0.0051
Piping Plover	4	0.0005
Purple Gallinule	3	0.0004
Purple Martin	25	0.0033
Red-Breasted Merganser	2	0.0003
Reddish Egret	4	0.0005
Red-shouldered Hawk	1	0.0001
Red-tailed Hawk	1	0.0001
Red-winged Blackbird	1	0.0001
Ring-billed Gull	3	0.0004
Rock Pigeon	42	0.0055
Roseate Spoonbill	42	0.0055
Rose-breasted Grosbeak	3	0.0004
Royal Tern	398	0.0519
Ruddy Duck	2	0.0003
Ruddy Turnstone	16	0.0021
Sanderling	30	0.0039
Sandwich Tern	99	0.0129
Seaside Sparrow	1	0.0001
Semipalmated Sandpiper	4	0.0005
Short-billed Dowitcher	3	0.0004
Snowy Egret	28	0.0036
Sooty Shearwater	1	0.0001
Sooty Tern	3	0.0004
Sora	3	0.0004
Spotted Sandpiper	1	0.0001
Surf Scoter	3	0.0004
Tricolored Heron	48	0.0063
Virginia Rail	1	0.0001
White Ibis	7	0.0009
White-tailed Tropicbird	1	0.0001
White-winged Dove	1	0.0001
Willet	12	0.0016
Wilson's Plover	3	0.0004
Yellow-billed Cuckoo	2	0.0003
Yellow-crowned Night-Heron	10	0.0013
Yellowlegs; Unidentified	1	0.0001
total		7673

Table 5: Final list of impacted species used in the prorating methodology and final prorating values for translating Shoreline Deposition Model and “Excluded Region” mortality estimates into species-specific injury quantifications, in order of greatest proportion to lowest. The list shows lines identifying the species list that comprised cumulative proportions of 90% and 95%.

	Total (DEAD & LIVE)	% of total	cumulative proportion of total
Laughing Gull	3792	0.494200	0.4942
Brown Pelican	1372	0.178809	0.6730
Northern Gannet	488	0.063600	0.7366
Royal Tern	398	0.051870	0.7885
Black Skimmer	196	0.025544	0.8140
Least Tern	124	0.016161	0.8302
Sandwich Tern	99	0.012902	0.8431
Common Loon	86	0.011208	0.8543
Clapper Rail	67	0.008732	0.8630
Great Blue Heron	64	0.008341	0.8714
Double-crested Cormorant	53	0.006907	0.8783
Forster's Tern	52	0.006777	0.8851
Cattle Egret	51	0.006647	0.8917
Tricolored Heron	48	0.006256	0.8980
American White Pelican	46	0.005995	0.9039
Rock Pigeon	42	0.005474	0.9094
Roseate Spoonbill	42	0.005474	0.9149
Pied-billed Grebe	39	0.005083	0.9200
Common Tern	32	0.004170	0.9241
Mallard	31	0.004040	0.9282
Herring Gull	31	0.004040	0.9322
Sanderling	30	0.003910	0.9361
Northern Mockingbird	28	0.003649	0.9398
Snowy Egret	28	0.003649	0.9434
Great Shearwater	25	0.003258	0.9467
Purple Martin	25	0.003258	0.9500
Caspian Tern	23	0.002998	0.9530
Black-crowned Night-heron	22	0.002867	0.9558
Great Egret	21	0.002737	0.9586
Green Heron	18	0.002346	0.9609
Mourning Dove	17	0.002216	0.9631
Blue-winged Teal	16	0.002085	0.9652
Ruddy Turnstone	16	0.002085	0.9673
Magnificent Frigatebird	14	0.001825	0.9691
Osprey	14	0.001825	0.9709

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American Oystercatcher	14	0.001825	0.9728
Willet	12	0.001564	0.9743
Yellow-crowned Night-Heron	10	0.001303	0.9756
Black Tern	9	0.001173	0.9768
Mottled Duck	9	0.001173	0.9780
Masked Booby	8	0.001043	0.9790
White Ibis	7	0.000912	0.9799
Audubon's Shearwater	5	0.000652	0.9806
Gull-billed Tern	5	0.000652	0.9812
Least Bittern	5	0.000652	0.9819
Little Blue Heron	5	0.000652	0.9825
Eurasian Collared-Dove	4	0.000521	0.9831
Killdeer	4	0.000521	0.9836
Lesser Black-backed Gull	4	0.000521	0.9841
Reddish Egret	4	0.000521	0.9846
Semipalmated Sandpiper	4	0.000521	0.9851
Piping Plover	4	0.000521	0.9857
American Coot	3	0.000391	0.9861
Black-necked Stilt	3	0.000391	0.9864
Chimney Swift	3	0.000391	0.9868
Common Gallinule	3	0.000391	0.9872
Northern Cardinal	3	0.000391	0.9876
Purple Gallinule	3	0.000391	0.9880
Ring-billed Gull	3	0.000391	0.9884
Rose-breasted Grosbeak	3	0.000391	0.9888
Short-billed Dowitcher	3	0.000391	0.9892
Sooty Tern	3	0.000391	0.9896
Sora	3	0.000391	0.9900
Wilson's Plover	3	0.000391	0.9904
European Starling	3	0.000391	0.9907
Surf Scoter	3	0.000391	0.9911
Cory's Shearwater	2	0.000261	0.9914
House Sparrow	2	0.000261	0.9917
Canada Goose	2	0.000261	0.9919
Common Yellowthroat	2	0.000261	0.9922
Neotropic Cormorant	2	0.000261	0.9924
Black-Bellied Whistling-Duck	2	0.000261	0.9927
Bridled Tern	2	0.000261	0.9930
Dunlin	2	0.000261	0.9932
Great Crested Flycatcher	2	0.000261	0.9935
Green-winged Teal	2	0.000261	0.9937
Leach's Storm-Petrel	2	0.000261	0.9940
Muscovy Duck	2	0.000261	0.9943

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Red-Breasted Merganser	2	0.000261	0.9945
Ruddy Duck	2	0.000261	0.9948
Yellow-billed Cuckoo	2	0.000261	0.9950
Bufflehead	2	0.000261	0.9953
Manx Shearwater	1	0.000130	0.9954
American Redstart	1	0.000130	0.9956
Brown Noddy	1	0.000130	0.9957
Brown Thrasher	1	0.000130	0.9958
Glossy Ibis	1	0.000130	0.9960
Virginia Rail	1	0.000130	0.9961
Baltimore Oriole	1	0.000130	0.9962
Barn Owl	1	0.000130	0.9964
Barn Swallow	1	0.000130	0.9965
Barred Owl	1	0.000130	0.9966
Belted Kingfisher	1	0.000130	0.9967
Black-bellied Plover	1	0.000130	0.9969
Boat-tailed Grackle	1	0.000130	0.9970
Bobolink	1	0.000130	0.9971
Broad-Winged Hawk	1	0.000130	0.9973
Brown-headed Cowbird	1	0.000130	0.9974
Carolina Wren	1	0.000130	0.9975
Cooper's Hawk	1	0.000130	0.9977
Eastern Kingbird	1	0.000130	0.9978
Eastern Meadowlark	1	0.000130	0.9979
Eastern Screech-Owl	1	0.000130	0.9980
Fulvous Whistling-Duck	1	0.000130	0.9982
Great Horned Owl	1	0.000130	0.9983
House Finch	1	0.000130	0.9984
Least Sandpiper	1	0.000130	0.9986
Lesser Scaup	1	0.000130	0.9987
Long-Billed Dowitcher	1	0.000130	0.9988
Red-shouldered Hawk	1	0.000130	0.9990
Red-tailed Hawk	1	0.000130	0.9991
Red-winged Blackbird	1	0.000130	0.9992
Seaside Sparrow	1	0.000130	0.9993
Sooty Shearwater	1	0.000130	0.9995
Spotted Sandpiper	1	0.000130	0.9996
White-tailed Tropicbird	1	0.000130	0.9997
White-winged Dove	1	0.000130	0.9999
Yellowlegs; Unidentified	1	0.000130	1.0000
Total	7673		

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## References

Industrial Economics, Incorporated (IEc). 2015. Deepwater Horizon/Mississippi Canyon 252 Oil Spill Natural Resource Damage Assessment Technical Report: Quantification of Nearshore Avian Mortality using the Shoreline Deposition Model and Lost at Sea Factor. Prepared for the Deepwater Horizon Natural Resource Damage Assessment and Restoration Program, U.S. Fish and Wildlife Service, U.S. Department of the Interior. September 1, 2015.

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