

**Alaska Department of Fish and Game  
State Wildlife Grant**

**Grant Number:** T-16

**Segment Number:** 4

**Project Number:** 6.0

**Project Title:** The North Pacific Seabird Web Portal: Collecting, Managing, and Sharing Alaska's Seabird Data

**Project Duration:** May 1, 2010 – December 31, 2013

**Report Due Date:** December 4, 2013

**Principle Investigator:** Priscilla Wohl

**Project Location:** Statewide: The field component will take place in all waters within Prince William Sound, Alaska, and land within 100 meters of the shore. The database components of this project will be completed primarily in the great Anchorage area.

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**I. PROBLEM OR NEED THAT PROMPTED THIS RESEARCH**

A large quantity of seabird data has been collected in Alaska and the North Pacific, but much of this data has not been organized into a coherent data framework. A few database structures which address specific components of a universal seabird dataset have been developed, but these independent data structures are generally isolated from one another and in some cases lack critical functionality. As a result, data management of seabird information is cumbersome and the data cannot be rapidly accessed, analyzed, distributed, or visualized. To address these problems, we proposed to expand the data management capabilities of the Seabird Information Network (SIN): North Pacific Seabird Data Portal to capture and absorb additional seabird datasets and information resources while being a more stable and useful repository for seabird data and information archival.

The proposed objectives were:

1. Collect data on population distribution and abundance, demographic parameters, and diet information on marine bird populations for analysis of viability and trends.
2. Obtain, compile, inventory, and evaluate existing data from the USFWS, the USGS, and academic institutions for inclusion in the database and seabird indicator indices.
3. Design a single merged data schema for seabird monitoring, colony, habitat and diet information which is geospatially enabled and temporally explicit.

4. Develop custom data entry tools utilizing modern programming techniques and technologies to develop a series of data entry interfaces for all types of relevant seabird data; enter contemporary and historical data using the North Pacific Web Portal.
5. Develop web based data access and visualization interfaces for users to download and query raw data based on geospatial and temporal criteria.
6. Absorb data from all available sources into the databases and create metadata.
7. Design a pilot distributed data management framework for the storage and dissemination of seabird data and seabird indicator indices.
8. Establish the capability within the U.S. Fish and Wildlife Service for long-term maintenance of the web site and database, and to incorporate new data as they are made available.

## **II. REVIEW OF PRIOR RESEARCH AND STUDIES IN PROGRESS ON THE PROBLEM OR NEED**

We know of no other work that is being done to address this problem. Alaska Ocean Observing System (AOOS) is compiling marine-focused datasets and databases and serve this information on their website (AOOS.org). To increase accessibility to Alaska's seabird data and build capacity among collaborators, we have agreed to allow AOOS to serve the seabird data portal from their website, in addition to Seabirds.net which provides access to SIN.

## **III. APPROACHES USED AND FINDINGS RELATED TO THE OBJECTIVES AND TO PROBLEM OR NEED**

In collaboration between the EVOS Trustee Council, National Fish and Wildlife Foundation (NFWF), Pacific Seabird Group, USGS, USFWS, the ADF&G, and academic institutions, the purpose of this project was to utilize four existing Alaska seabird databases (i.e., North Pacific Seabird Colony Register, North Pacific Pelagic Seabird Database, North Pacific Seabird Monitoring Database, and North Pacific Seabird Diet Database) with historical data and Seabird Indicator Indices, which provide an immediate evaluation of seabird productivity, population trends, and mortality events. Pertinent data sets from Alaska were located, compiled and archived in a common (uniform) format, and shared using web-based dissemination of the data to scientists, resource managers, and the general public. The North Pacific Seabird Data Portal, which will continue to be maintained by the USFWS, provides researchers, wildlife and resource managers, and policy makers, both within and outside the state of Alaska, with a broad and high resolution picture of the dynamic marine ecosystem.

## **IV. MANAGEMENT IMPLICATIONS**

The Seabird Information Network (SIN): North Pacific Seabird Data Portal provides an easy way to quantify/measure outcomes of seabird management and conservation efforts in the North Pacific. The portal provides researchers and managers with up-to-date tools to store data and visualize population trends, seabird distribution, and reproductive success, which all serve as proxies to the overall health of marine ecosystems. Researchers have a place to archive data and make it available to other scientists, which also helps identify areas needing additional study, or help restoration planning efforts or endangered species recovery. Managers are provided an important tool for developing land protection plans, conducting environmental assessments, and

planning response to oil spills and ship groundings. Coordinating the collaboration and communication among groups involved in seabird issues, research and management activities in the North Pacific are primary goals of the USFWS. A fully integrated seabird data portal will improve Strategic Habitat Conservation and other management plans by making seabird data available to regional, national, and international databases used in guiding policy and management initiatives for multiple seabird species.

## V. SUMMARY OF WORK COMPLETED

***Objective 1.*** *Collect data on population distribution and abundance, demographic parameters, and diet information on marine bird populations for analysis of viability and trends.*

Data collection on seabird distribution and abundance, demographic parameters, and diet information on marine bird populations is an ongoing task in Alaska. During this project, several large datasets for the North Pacific Seabird Colony Register and the North Pacific Seabird Diet Database (both historical and new data) have been formatted and added to the SIN North Pacific Seabird Data Portal. Data entry and ingestion of datasets contributed by biologists at Migratory Bird Management (MBM), Kodiak NWR, Alaska Maritime NWR (AMNWR), Alaska Peninsula NWR, Katmai NP, Kenia Fjords NP, and the US Forest Service (Juneau Ranger District) will continue, with communications regarding colony updates occurring at annual intervals and led by the USFWS Region 7 (Alaska) Seabird Data Coordinator in MBM (Anchorage, Alaska).

***Objective 2.*** *Obtain, compile, inventory, and evaluate existing data from the USFWS, the USGS, and academic institutions for inclusion in the database and seabird indicator indices.*

Identifying available historic and contemporary seabird data (including colony census visits, diet data samples, and at-sea seabird data) is on-going. To coordinate the monumental objective, Northern Forum (NF) has been working with the AMNWR, MBM, USGS, and ADF&G-Kachemak Bay Research Reserve to compile available seabird data for inclusion in the North Pacific Seabird Colony Database (colony data), the North Pacific Seabird Diet Database (diet data), as well as information on seabird productivity and population trends (seabird indices). A North Pacific Seabird Data Portal Steering Committee was developed with the goal of encouraging buy-in to the Data Portal by providing data contributors and data users with the opportunity to provide input on web-based development both for data entry, data ingestion, and data display.

***Objective 3.*** *Design a single merged data schema for seabird monitoring, colony, habitat and diet information which is geospatially enabled and temporally explicit.*

A single merged data schema for the Seabird Colony Register (Appendix A), habitat and diet information has been designed and is being refined using open source database software/programming and open source web services and performs well in a number of web browsers and mobile devices (including iOS; i.e., iPad, iPhone). Development of a merged data schema for the North Pacific Seabird Diet Database has been more challenging owing to (1) a lack of metadata for several datasets, and (2) historic seabird diet datasets for the Outer Continental Shelf Environmental Assessment Program (OCSEAP) which were archived in a

summarized format (i.e., pooled across samples, pooled across species, and/or pooled across geographic area). Lacking the rigorous metadata collected during scientific studies today, it is generally impossible to recreate the granular level needed by today's seabird diet researchers. Additionally, collection of diet data has transitioned from lethal methods (collection of live birds for stomach content analysis) to less invasive methods (stomach lavaging, deploying screens at burrow entrances, mist-netting of provisioning adults). Toiling with these issues has provided excellent guidance on how contemporary seabird diet samples are analyzed, archived, and displayed to the general public. Based on these changes in data collection paradigm, the North Pacific Seabird Diet Database data schema (Appendix B) was refined during collaborative meetings with the MBM, AMNWR, KBRR, and Axiom Consulting and Design database programmers to develop a single merged data schema for seabird diet information in the North Pacific.

***Objective 4. Develop custom data entry tools utilizing modern programming techniques and technologies to develop a series of data entry interfaces for all types of relevant seabird data; enter contemporary and historical data using the North Pacific Web Portal.***

Custom data entry tools utilizing modern programming techniques and technologies have been developed for the North Pacific Seabird Colony Register. Subsequently, the User Interface for the Diet Database has been evaluated by staff at KBRR, AMNWR, MBM, and the University of Alaska Fairbanks. Comments and input were received and we are moving forward on making changes and modification based on these evaluations. To streamline the process of contributing as well as updating seabird colony data in the North Pacific Seabird Colony Register, a Microsoft Excel template was developed to mimic a relational database where 'Workbook=Database', 'Spreadsheets=Tables', and 'Designated Column=Primary Key' and functions to link table relationships (Appendix C). The use of an Excel Template (versus a Microsoft Access Database) was done to provide seabird researchers a (1) familiar and accessible format (free applications available; e.g., [openoffice.apache.org/](http://openoffice.apache.org/)) to contributing colony data, while (2) reducing data entry errors (using pull-down menus) and (3) simplifying the arduous task of assigning relationships for data fields from a contributed dataset to the online colony register data schema.

***Objective 5. Develop web based data access and visualization interfaces for users to download and query raw data based on geospatial and temporal criteria.***

Axiom has developed and is hosting the first version of the SIN North Pacific Seabird Data Portal ([http://axiom.seabirds.net/maps/js/seabirds.php?app=north\\_pacific&v=rand](http://axiom.seabirds.net/maps/js/seabirds.php?app=north_pacific&v=rand)). Data managed by the system include seabird colony location, species abundance and diversity, diet, boat-based observations and other metrics. Users submit spatially-referenced data into the automated data entry application which has been developed in Javascript (migrated from Coldfusion during this project to increase scalability of the platform) uses a PostgreSQL Server for database management (migrated from a SQL Server during this project; also to improve scalability and accessibility during interoperability transactions). These changes removed the system's dependence on proprietary software to open-source software. The Seabird Colony Register and Seabird Indicator Indices can be queried using a Google Maps interface. Time series, data queries and data downloads are functional. The display of the multiple databases is technically challenging, but the website programmers have been successful. After completing

changes to both the data display and the data entry application, web-based access to seabird data was made available in both on-line visualization and downloadable seabird data.

***Objective 6.*** *Absorb data from all available sources into the databases and create metadata.*

This has been a time-consuming task because most data require some degree of reformatting and markup, quality control, and standardization. Similar to Objective 2, most data require reformatting, quality control, and standardization. Data entry has been performed by the USFWS and updates to the North Pacific Seabird Colony Register are planned to occur at quarterly throughout the year. To date, the Colony Register contains census count data for: 1866 colonies (Alaska and Russian Far East), including 16,186 colony status records (species count reported during a colony visit), 131 records for the Seabird Productivity Index, and 60 records for the Seabird Population Trend Index (Appendix D). To date, the Diet Database contains: 27,422 diet sample records ranging from 1980s to 2012. Metadata has been created and is available at: <http://axiom.seabirds.net/files/NorthPacificSeabirdDataManagementSystem.xml>

***Objective 7.*** *Design a pilot distributed data management framework for the storage and dissemination of seabird data and seabird indicator indices.*

We have designed a distributed data management framework for the storage and dissemination of seabird data and seabird indicator indices and have made four significant upgrades to the North Pacific Seabird Data Portal based on user feedback and input. Using the disparate data sources and types identified in Objective 1 and Objective 2, a spatially enabled relational database management system (PostgreSQL Server) was developed to manage data and a Geoserver to visualize those data. The National Fish and Wildlife Foundation is providing funding support to serve Alaska Audubon's Marine Important Bird (BirdLife International partnership) and the North Pacific Pelagic Seabird Database (managed by the USGS Alaska Science Center). The latter project is awaiting final transfer of the database.

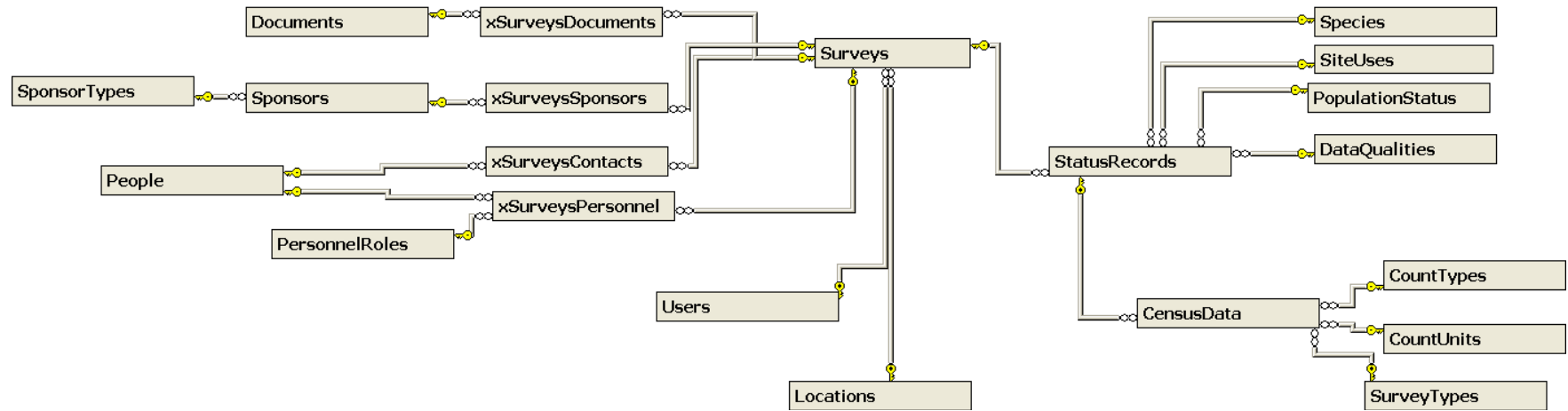
***Objective 8.*** *Establish the capability within the U.S. Fish and Wildlife Service for long-term maintenance of the web site and database, and to incorporate new data as they are made available.*

The FWS currently maintains and administers the North Pacific Seabird Data Portal. New data contributed to SIN will be submitted to the Seabird Data Coordinator. Furthermore, under the new FWS Data Management Policy currently being developed, all Region 7 (Alaska) FWS projects funded partially or entirely by the FWS will be required to provide open access to metadata, scientific data and data products. As such, management of the Data Portal has been added to the duties of the MBM Seabird Data Coordinator.

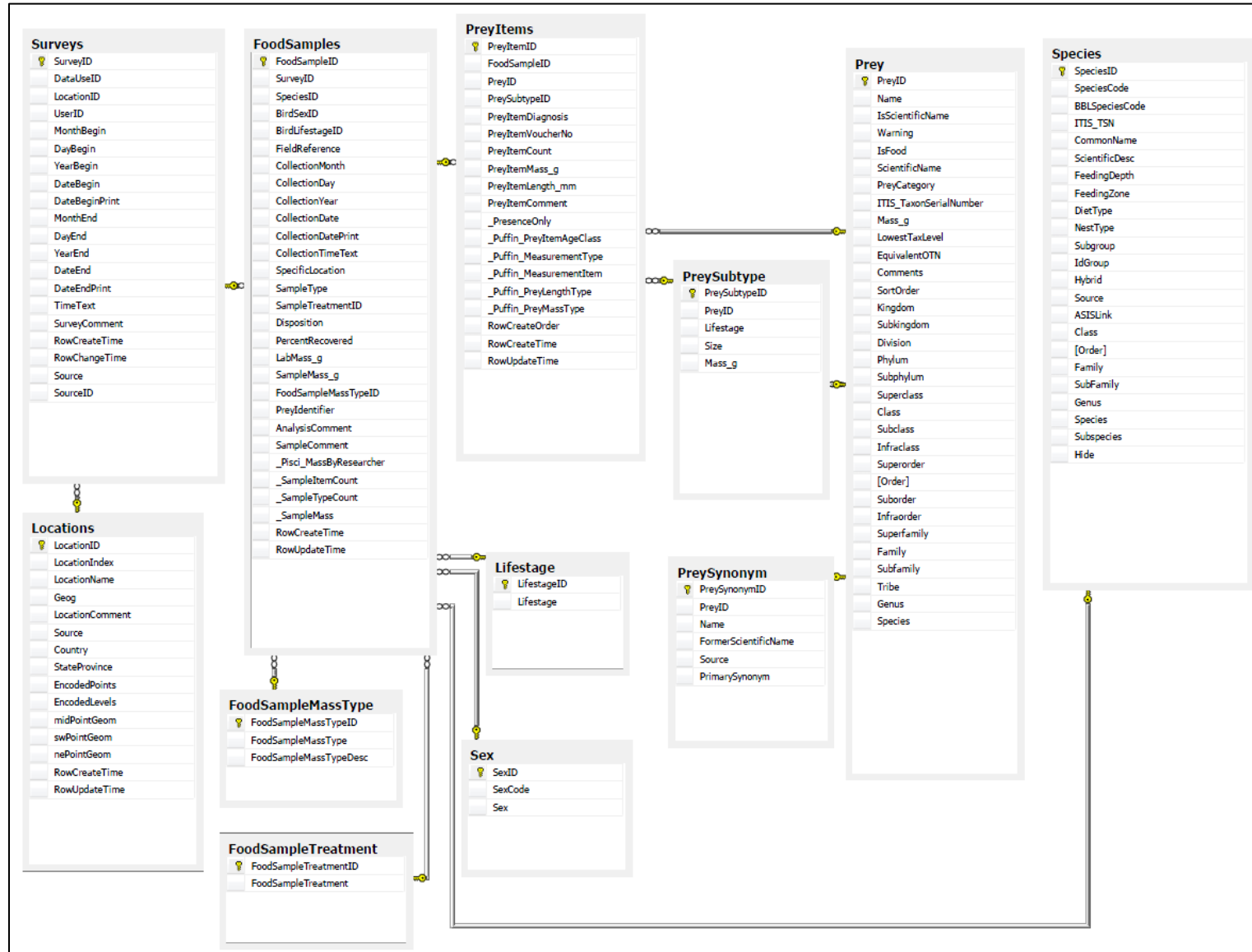
**Prepared by:** Priscilla Wohl, David Irons, and Robb Kaler

**Date:** December 04, 2013

Appendix A. North Pacific Seabird Colony Register Data schema.



Appendix B. North Pacific Seabird Diet Database data schema.



Appendix C. Standardized list of tables, attribute fields, and descriptions for the Seabird Data Entry Excel Template.

Table Name	Field Name	Description
location		Records of spatially explicit seabird location information. Locations represent survey sites, which are usually seabird colonies.
location	index	Field for agencies to input location aliases or internal tracking numbers
location	name	The location's name
location	comments	Location comments field
location	decimal_latitude	Decimal latitude of survey location. Use negative values for southern latitudes.
location	decimal_longitude	Decimal longitude of survey location. Use negative values for western longitudes.
survey		Observation events at specific locations and times or time periods
survey	data_use_id	
survey	location_id	Foreign key links to location table
survey	begin_year	Numeric year - start of survey
survey	begin_month	Numeric month -- beginning date of field work relevant to the survey
survey	begin_day	Numeric day of month--first day of field work relevant to the survey
survey	end_year	Numeric year - end of survey
survey	end_month	Numeric month -- ending date of field work relevant to the survey
survey	end_day	Numeric day of month--last day of field work relevant to the survey
survey	time_text	Text field capturing time of day or range of hours during which survey occurred, if reported (else 'unspecified'), e.g. 0930-1145. May include time zone designation.
survey	comments	Survey comments field
status_record		Status records represent a best estimate of the population (total or breeding) of a species at a specific location and time
status_record	data_quality_id	Foreign key links to data quality lookup table
status_record	site_use_id	Foreign key links to site use lookup table
status_record	species_id	Foreign key links to species table
status_record	species_abundance_id	Foreign key links to species abundance lookup table
status_record	survey_id	
status_record	total_breeding	Total number of breeding individuals of this species for survey, as reported or derived
status_record	total_population	Total number of all individuals of this species for survey, as reported or derived
status_record	conversion	Notes indicating how admin used info in census_data table to produce total_population and/or total_breeding value
status_record	best_current_value	True/false value, defaults to most recent estimate unless over-ridden by admin; only one status record per location/species should have a true value
status_record	comments	Comments field



Appendix C (continued). Standardized list of tables, attribute fields, and descriptions for the Seabird Data Entry Excel Template.

Table Name	Field Name	Description
census_data		Records of raw observations of bird populations (used to calculate status record)
census_data	count_type_id	Foreign key links to count_type lookup table
census_data	count_unit_id	Foreign key links to count_unit lookup table
census_data	status_record_id	Foreign key links to status_record table
census_data	survey_type_id	Foreign key links to survey_type lookup table
census_data	count_value	Raw count of census units reported by observer
census_data	count_increment	'Counted by' value (e.g. 1, 2, 5, 10, 100, 1000 or other) reported by observer, if any
census_data	lower_bound	Observer's estimated minimum census value, if reported
census_data	upper_bound	Observer's estimated maximum census value, if reported
census_data	replicates	Number of counts contributing to a reported average value, where applicable
census_data	standard_deviation	Standard deviation of replicated counts, where applicable
census_data	comments	Census data comments
survey_document		Relates surveys to documents
survey_document	document_id	Link to document table
survey_document	survey_id	Link to survey table
survey_personnel		Relates surveys to personnel
survey_personnel	person_id	Link to person table
survey_personnel	personnel_role_id	Link to personnel role table
survey_personnel	survey_id	Link to survey table
survey_personnel	primary_contact	Indicates if this person is the survey's primary contact
survey_sponsor		Relates surveys to sponsors
survey_sponsor	sponsor_id	Link to sponsor table
survey_sponsor	survey_id	Link to survey table
survey_study		Relates surveys to studies
survey_study	study_id	Link to study table
survey_study	survey_id	Link to survey table

Appendix C (continued). Standardized list of tables, attribute fields, and descriptions for the Seabird Data Entry Excel Template.

Table Name	Field Name	Description
document		Documents relating to seabird information
document	authors	Use format: First Author LastName, First Author Initials, Second Author Initials+Second Author LastName...., and Last Author Initials+Last Author Last Name
document	author_count	Number of authors listed in document citation
document	first_author	Last name of first author (to use as query filter)
document	second_author	Last name of second author (used in creating document ref)
document	when_published	Date of publication. Usually year, but also specific to month or day when appropriate.
document	document_title	Capitalize first word only in title
document	where_published	All remaining reference data including journal volume & pages, book publisher, book editor(s) and article page numbers, etc.
document	filename	Filename of uploaded document
document	comments	Comment field
person		People involved in seabird studies. Can be field personnel, data contacts, etc.
person	last_name	Last name
person	first_name	First name
person	nickname	Nickname
person	middle_name	Middle initial or name
person	suffix	Optional name suffix (Sr, Jr, III, etc)
person	address1	Mailing address
person	address2	Mailing address line 2 (optional)
person	city	City
person	state_or_province	State or province
person	postal_code	Postal code
person	country	Country
person	phone	Phone number including country/city codes and extension if applicable
person	email	Current e-mail address
person	comments	Comment field

Appendix C (continued). Standardized list of tables, attribute fields, and descriptions for the Seabird Data Entry Excel Template.

Table Name	Field Name	Description
sponsor		
sponsor	sponsor_type_id	Category indicating type of organization (e.g., Federal, State, Private, etc.)
sponsor	name	Title of sponsoring organization (e.g., U.S. Minerals Management Service)
sponsor	acronym	Acronym for sponsor (USFWS, USGS, etc)
sponsor	subunit	Subunit title of sponsoring organization (e.g., OCS Regional Office, Anchorage)
sponsor	subunit_acronym	Acronym for sponsor subunit
sponsor	address	Mailing address
sponsor	city	City
sponsor	state_or_province	State or province
sponsor	postal_code	Postal code
sponsor	country	Country
sponsor	phone	Phone number including country code
sponsor	website	Website
sponsor	comments	Sponsor comments
study		Seabird study reference
study	contributor	Name of study contributor
study	study_type	Study types are 'Food samples analysis', 'Fatty acid analysis', 'Stable isotope analysis ', and 'Proximate analysis'
study	comments	Comments on study
sponsor_type		
sponsor_type	name	Short name for sponsor type
sponsor_type	description	Sponsor type description
sponsor_type	sort_order	
personnel_role		Personnel roles
personnel_role	name	Personnel role name
personnel_role	description	Personnel role description
personnel_role	sort_order	
survey_type		Type of survey
survey_type	name	Survey type name
survey_type	description	Survey type description
survey_type	sort_order	Specifies which order the lookup values should be sorted in

Appendix C (continued). Standardized list of tables, attribute fields, and descriptions for the Seabird Data Entry Excel Template.

Table Name	Field Name	Description
count_unit		Unit of count
count_unit	name	Count unit name
count_unit	description	Count unit description
count_unit	sort_order	Specifies which order the lookup values should be sorted in
count_type		Type of count
count_type	name	Count type name
count_type	description	Count type description
count_type	sort_order	Specifies which order the lookup values should be sorted in
species_abundance		
species_abundance	name	Species abundance name
species_abundance	description	Species abundance description
species_abundance	sort_order	Used to indicate in which order the values should appear
species		Seabird species reference including scientific name
species	species_code	
species	bbl_species_code	Unique 4-letter alpha code from list published by U.S. Bird Banding Lab
species	itis_tsn	ITIS Taxonomic Serial Number (if available)
species	common_name	AOU accepted common name
species	scientific_desc	
species	feeding_depth	Coded to indicate typical feeding depth (e.g., surface feeder or diver)
species	feeding_zone	Coded to indicate relative distance offshore at which species typically forages
species	diet_type	Coded to indicate major components of diet (e.g., Piscivore, Planktivore, Omnivore)
species	nest_type	Coded to indicate usual nest type (e.g., burrow, cliff-ledge, crevice, open ground, tree, etc.)
species	subgroup	
species	id_group	
species	hybrid	
species	source	
species	asis_link	
species	class	
species	order	

## Appendix C (continued). Standardized list of tables, attribute fields, and descriptions for the Seabird Data Entry Excel Template.

Table Name	Field Name	Description
species	family	Latin family name
species	subfamily	
species	genus	Scientific genus name
species	species	Scientific species name
species	subspecies	
species	hide	
site_use		
site_use	name	Site use name
site_use	description	Site use description
site_use	sort_order	Indicates in which order the values should be displayed
data_quality		Data quality of count
data_quality	name	Data quality name
data_quality	description	Data quality description
data_quality	sort_order	Specifies which order the lookup values should be sorted in
data_use		Data use codes
data_use	name	Data use name
data_use	description	Data use description
data_use	sort_order	Specifies which order the lookup values should be sorted in

Appendix D. Standard definitions used for the North Pacific Seabird Productivity Index and the North Pacific Seabird Population Trend Index.

#### **SEABIRD PRODUCTIVITY INDEX DEFINITION**

Use chicks fledged per nest or site over mean clutch size for each species  
[# chicks fledged per nest or site / mean clutch size for the species].

**Green** = Good productivity:  $\geq 50\%$  of mean clutch size

**Amber** = Moderate productivity:  $> 10\%$  to  $< 50\%$  mean clutch size

**Red** = Poor productivity:  $\leq 10\%$  of mean clutch size

#### **POPULATION TREND INDEX DEFINITION**

Must have colony size data (or representative plots) for at least 2 data points 5 or more years apart in a decade. Where information is sparse, span of data points may be stretched to 15 years. Population trends should be analyzed using linear regression models on log-transformed data (ln).

**Green** = Increasing population trend of  $> 3\%$  per annum change

**Amber** = Stable population trend between  $> -3\%$  and  $< 3\%$  per annum change

**Red** = Decreasing population trend of  $\leq -3\%$  per annum