QUALITY ASSURANCE PROJECT PLAN

For

RECONNAISSANCE OF THE BIOLOGICAL LIMNOLOGY OF THE SALTON SEA

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and
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Project Management

QUALITY ASSURANCE/QUALITY CONTROL STATEMENT
Alt Project Title: Salton Sea plankton and benthos

Organization: Center for Inland Waters

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Technical Project Manager: Dr. Stuart H. Hurlbert

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QA Coordinator: Dr. Barry Gump - Salton Sea Authority

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SS Project Officer: Dr. Doyle Stephens - US Geological Survey

A2 Table of Contents and Document Control Format

A3 Distribution List	3
A4 Project/Task Organization	5
A5 Problem Definition/Background	6
A6 Project/Task Schedule	8
A7 Quality Objectives and Criteria for Measurement Data	10
A8 Special Training Requirements/Certification	11
A9 Documentation and Records	11
B Measurement/Data Acquisition	
B1 Sampling Process Design	12
B2 Sampling Methods Requirements	15
B3 Sample Handling and Custody Requirements	15
B4 Analytical Methods Requirements	16
B5 Quality Control Requirements	17
B6 Instrument Testing, Inspection, Maintenance	18
B7 Instrument Calibration and Frequency	19
B8 Inspection/Acceptance Requirements for Supplies	19
B9 Data Acquisition Requirements	19
B10 Data Management	19
C Assessment/Oversight	
C1 Assessment and Response Actions	20
C2 Reports to Management	20
D Data Validation and Usability	
D1 Data Review, Validations, and Verification Requirements	20
D2 Validation and Verification Methods	21
D3 Reconciliation with User Requirements	21
Literature Cited	22

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A4: Project/Task Organization

Field Sampling:

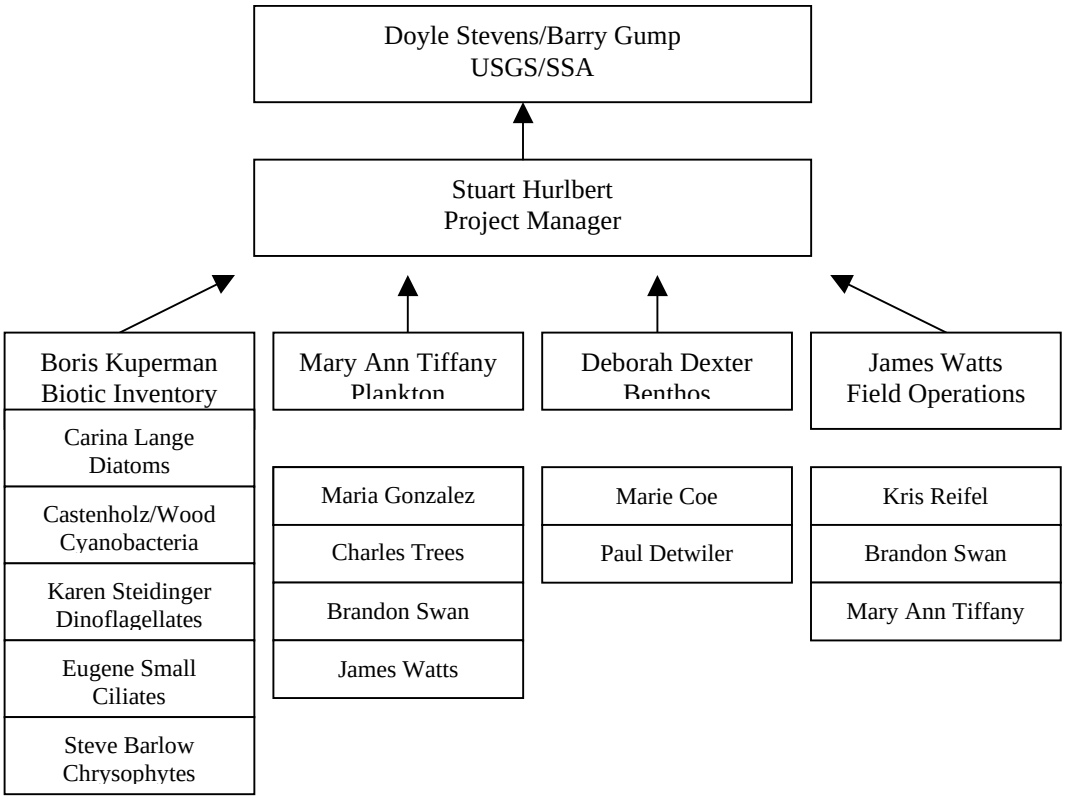
Qualitative and quantitative field sampling of organisms for the plankton project will be overseen by the project manager, Dr. Stuart H. Hurlbert. Kristen Reifel, Brandon Swan, Mary Ann Tiffany, and James Watts will be involved in all or some of said field sampling. Field assistants or undergraduate students may be employed in some sampling under supervised conditions.

All of the field sampling, and sorting for the benthos project will be overseen by Dr. Deborah Dexter and conducted by Dr. Deborah Dexter, Marie Coe, and Paul Detwiler. Student assistants will also help with fieldwork.

Laboratory Sample Processing

Plankton sample counting, chlorophyll analysis, and appropriate statistical analysis will be performed by Dr. Maria Gonzalez, Kristen Reifel, Brandon Swan, Mary Ann Tiffany, and James Watts and overseen by Dr. Stuart H. Hurlbert. No assistants or undergraduate personnel will be employed in this regard.

Benthic sample laboratory analysis will be by 3 persons (Dexter, Coe, and Detwiler). Student assistants may assist with laboratory work, but not in identification or quantification of organisms.



Biotic Inventory

Field sampling for the biotic inventory segment will be undertaken by the above mentioned sampling teams. The overseeing of these teams will be a split responsibility between Stuart H. Hurlbert, Boris Kuperman, and appropriate co-PI as specified by expertise. Sample protocols are the responsibility of the appropriate co-PI, and not those performing the field sampling, unless sampling is performed by the appropriate co-PI.

QA Manager

Dr. Doyle Stephens and Dr. Barry Gump are responsible for the review the quality control checks generated by the project.

A5: Problem Definition/Background

Comprehensive ecological studies of the Salton Sea were undertaken by Arnal in 1958 (benthic foraminiferans), Walker in 1961 (biotic survey of the Salton Sea), Carpelan in 1969 (phytoplankton, zooplankton, and zoobenthos), and the US Department of the Interior in 1970 (phytoplankton, physical and chemical limnology). Since these studies the Salton Sea has increased in salinity, increased in volume, and its watershed has undergone changes in land use (Watts et al 1999). This study begins a reconnaissance of selected biota in the Salton Sea to provide the necessary baseline data for the NEPA/CEQA evaluation of the Salton Sea Restoration Project. This reconnaissance will consist of a biotic inventory, studies of spatial and temporal distributions of benthic and planktonic communities, and a survey of potential toxic algae species.

Biotic Inventory

Aside from the birds and the fish, the biota of the Salton Sea is poorly known. During previous monitoring programs, samples of invertebrates and protists has turned up forms not previously recorded, or, in some cases, forms that were misidentified by previous works. Yet nothing is more fundamental to an understanding of the biology of the Sea than knowing what species are present. Without that knowledge we cannot access the most pertinent scientific literature and are poorly positioned to assess functional relationships, effects of future salinity increase, or impacts of engineering projects.

Benthos

The only quantitative sampling of the Salton Sea benthos was done during the 1950s (Walker, 1961) which sampled invertebrate species found in lake sediments over a 28 month period and included studies on the marine polychaete worm *Neanthes succinea* and the barnacle *Balanus amphitrite*. The report also includes comments on some of the meiobenthos.

Plankton

The photosynthetic algae and zooplankton of any water body form the lower levels of the food web. In the Salton Sea the abundance of algae is very high due to nutrient inputs from agricultural and municipal wastewater. Two surveys of the plankton in the Salton Sea were completed decades ago (Carpelan 1961, and USDI 1970) when the salinity of the lake was near to that of seawater. There are no phycological or zooplankton studies in the scientific or gray literature at present salinity conditions.

Toxic Algae

Not much is known about the toxicity of the algal species found in the Salton Sea. Only three reports (Carpelan 1961, USDI 1970, Gonzalez et. al. in preparation) have provided substantive information on the algae of the Salton Sea. Various dinoflagellates and other species are likely to be toxic (see Table 2). Recurring major mortality events in the eared grebe occur during the winter and early spring at the Salton Sea, and major fish kills are common.

A6: Project/Task Schedule

Vertical profiles of plankton will be obtained at five fixed stations at two-week intervals for a period of 1 year ending in December, 1999. Three of these stations are aligned along the lake's main axis, and were selected to represent the main water mass of the lake (S 1-3). Two stations will be sampled and were chosen to represent contrasting conditions at the lake's southern end (S 4-5). These stations are important as 78% freshwater comes into the lake via the New and Alamo rivers at the southern end.

S-1 115º 55' lat. 33º 25' long.
S-2 115º 51' lat. 22º 21' long.
S-3 115º 48' lat. 33º 18' long.
S-4 115º 38.5' lat. 33º 16.3' long.
S-5 115º 45.03' lat. 33º 10' long.

Triplicate phytoplankton samples and duplicate zooplankton samples will be taken bi-weekly at the five Salton Sea stations. Phytoplankton will be sampled using 3 integrated sample depths (0-3m, 3-6m, and 6-9m) at each of the five stations. Zooplankton will be sampled using a series of discrete 32 liter collections at 2 meter intervals starting at 0.5m. We will generate 45 phytoplankton samples per sampling date and approximately 46 zooplankton samples. 1014 phytoplankton samples and 1404 zooplankton samples will be generated during the life of the project.

The biotic inventory will focus on 6 taxonomic groups: cyanobacteria, dinoflagellates, chrysophytes and raphidophytes, diatoms, free-living and epizoic ciliates. Each group will be responsible for 1-2 sampling trips to the Sea to collect material. Additional material may be collected by the field sampling team (specified in §A4) with specified instruction from the particular biotic inventory

group. Although exact numbers of samples are not specified, enough sites will be sampled to survey major environments present at the Salton Sea.

Each taxonomic specialist (co-PI) was chosen for their expertise of a particular taxonomic group. Their credentials are provided in the form of *curricula vitae* attached at the end of this document.

The benthos work on this project includes obtaining, sorting, identifying, and quantifying the benthos of the Salton Sea with field sampling occurring bimonthly (Jan., March, May, July, Sept. and Nov. 1999). The focus of the benthic study includes: 1) soft bottom grab samples from the Salton Sea. 2) nocturnal macrozooplankton tows of vertically migrating reproductive benthic organisms 3) shoreline sand/shell samples and samples of barnacles and algae from rocks. 4) determination of sediment particle size (associated with grab samples and shoreline sand/shell samples) and organic content (associated with grab samples).

The timeline for benthic field sampling is bimonthly, beginning in January, 1999 and concluding in November, 1999. Laboratory analysis for each sampling effort will be concluded before the next bimonthly field sample date. The first progress report is due May 30, 1999, the second November 30, 1999, and the final report on March 30, 2000.

Monthly progress reports, check counts on 10% of all counts performed, and quarterly equipment calibrations will be performed to meet quality control guidelines to be specified below. Quality assessments of the biotic inventory will be in the form of peer review (i.e. illustrated catalog).

Data will be recorded on field note sheets, counting sheets, statistics sheets, monthly progress reports, quarterly assessment reports, and a final summary document. Examples of field note sheets, statistics sheets, and counting sheets are included as attachments in this document. These provide a standardized format to ensure consistent data recording. Two progress reports and a final summary document will be generated, synthesizing our progress and current body of knowledge.

Sampling schedules for plankton and benthos projects

Plankton Group

Sampling Times	**Dates**
2	**Jan. 25**
3	**Feb. 15**
4	**February 15**
5	**February 29**
6	**March 15**
7	**March 19**
8	**April 12**
9	**April 26**

10	**May 10**
11	**May 24**
12	**June 7**
13	**June 21**
14	**July 5**
15	**July 19**
16	**August 2**
17	**August 16**
18	**August 30**
19	**September 13**
20	**September 27**
21	**October 11**
22	**October 25**
23	**November 15**
24	**November 29**
25	**December 13**
26	**December 27**

Benthos Group

Sampling Times	**Dates**
1	**Jan. 11-16**
2	**Mar. 27-31**
3	**May 21-26**
4	**July 12-17**
5	**Sept 4-10**
6	**November 5-9**

A7: Quality Objectives and Criteria for Measurement Data

The objectives of this plankton project study are to document the abundance and distribution, horizontally and vertically, of zooplankton and phytoplankton in the Salton Sea for the duration of 1 year. (2) To identify the distribution and abundance of the benthic fauna in the Salton Sea during a 1 year period, and (3) to catalog species of the major taxa present in the Salton Sea.

Plankton distributions are patchy and heterogeneous. Duplicates are enumerated to allow mean abundance, standard deviation, and confidence intervals to be calculated. Using these statistics the variability within a data set can be assessed. Field samples, but not the analyses (statistics, and check counts), are subject to tolerable error. Tolerable error is defined at by our 50/50 rule (see §B5).

Although the distribution of benthic fauna is also highly variable through time and space, the replicated sampling procedures will produce means and confidence limits that are representative of the specific habitats. Since samples have not been collected from the sea bottom since 1954, and the other benthic habitats have never been sampled, it is not possible to predict the variability among the samples at this time.

A combination of published literature and professional experience will be employed by each specialist to ensure correct species identifications are made (see §A8).

A8: Special Training Requirements/Certification

Training for persons carrying out plankton identification and enumeration is needed to ensure consistent species identification between enumerators. To aid in this endeavor a species catalog depicting all identified species will be used. This species catalog includes photographs of both living and preserved material. Enumeration of samples will only be undertaken by trained individuals (Maria Gonzalez, Kristen Reifel, Brandon Swan, Mary Ann Tiffany, and James Watts) working directly with the species catalog.

Dr. Deborah Dexter, Paul Detwiler, and Marie Coe, all of who are trained in sediments, benthic invertebrates, and taxonomic identifications, will perform benthic sorting, identification, and analyses.

A9: Documentation and Records

Our raw data are recorded on field logs, counting sheets, and record sheets. These documents will exist as hard copy and electronic documents. Hard copies of the relevant forms will be kept with the samples as well as collected in a central binder.

The raw data will be reported in two progress reports and a final report. These documents will exist as electronic and hard copies. These documents will be submitted to the Salton Sea Science Subcommittee in a timely fashion per contract specifications. Relevant forms are included as attachments in this document.

Measurement/Data Acquisition

B1: Sampling Process Design (Experimental Design)

1. Plankton Sampling

Plankton will be collected on 26 sampling dates taken at two week intervals, weather permitting. One complete sample set (outlined below) are taken at the five fixed stations each sampling date. Each date is numbered sequentially and appropriately dated. The sampling set consists of 39 phytoplankton samples and 54 zooplankton samples.

Three phytoplankton samples and two zooplankton samples are taken at each depth interval. Two samples of each type are used for enumeration as specified in the sampling process section. The third phytoplankton sample is archived for qualitative taxonomic purposes.

There are 39 phytoplankton samples in each sample set. Triplicate samples are taken using independent casts of the 3 meter long sampling tube (see §B4). Three casts at three depths (0-3, 3-6, and 6-9 meters) are done at stations 1-3, and three casts at two depths (0-3, and 3-6 meters) are taken at stations 4 and 5.

There are 54 zooplankton samples in each sample set. Duplicate samples are taken using duplicate drops of a 32 L Schindler trap (see §B4) at 2 meter intervals. Station 1 is sampled at 7 depths to 12.5 meters, stations 2 and 3 are sampled at 6 depths to 10.5 meters, and stations 4 and 5 are sampled at 4 depths to 6.5 meters.

All samples collected in a sample set are taken to represent the phytoplankton and zooplankton present in the water column at each station at the time of the sampling. The sampling procedures are quantitative. The five stations were chosen to represent the main mass of the lake (stations 1-3) and to represent contrasting conditions at the lake's southern end (stations 4 and 5).

Each critical sample is enumerated and numerical density (number/l), and biovolume density (mm^3/l) of each species is calculated. Phytoplankton samples are also be analyzed for chlorophyll concentrations.

2. Biotic Inventory

Biotic inventory samples are the responsibility of the individual taxonomist participating in the biotic inventory. These samples will be collected using methods designed to allow for accurate taxonomic identification.

3. Soft bottom benthic samples of the Sea bottom

The soft bottom of the lake will be sampled using a petite Ponar grab. The petite Ponar grab samples an area of 15 x 15 cm with a volume of 2.4 L, and is designed to sample a variety of unconsolidated hard (gravel, shell) and soft sediments. This grab samples the same area as the Ekman grab used in the 1961 Walker study, but is better at sampling a variety of sediments, and is designed to prevent sample loss during closure (Greenberg A.E., L.S. Clesceri, and A.D. Eaton (eds). 1995. Standard Methods For the Examination of Water and Wastewater 18th Edition. American Public Health Association, American

Water Works Association, and Water Environmental Federation, Washington, D.C.).

Three transects will be sampled from the shallow 2 meter site directly toward the plankton stations S1-3. Six sites will be sampled along each transects and will include depths from shallow (2 and 4 m), mid (6 and 8 m), and deep (10 and 12 m). Transect 1 will begin at State Park Headquarters and terminate at S1, Transect 2 will run from Bombay Beach to S2, and Transect 3 from the shoreline due west to S3. Six sites (at depths of 2,4,6,8,10 and 12 m) along 3 transects will be sampled using a petite Ponar grabs. The precise location of each site will be determined using a GPS (UTM location) and a fathometer (depth). Three replicate grabs will be taken at each site using a small powered winch. The contents of each grab will be transferred to a sorting tray located on the side of the boat. A removable 1000 µm sieve will be placed in this tray, and water driven by a small pump will be used to wash the finer sediment through the sieve. Each grab sample will be placed in a 1000 µm sieve and carefully washed. The remaining contents will be transferred to a container, a solution of 10% buffered formalin used to preserve the sample, rose bengal added to stain organisms, and the container labeled both inside and outside (Clesceri et al 1998).

Sample numbers will be assigned codes by basic collecting method, transect location, depth, date of sample, and replicate number, and other appropriate information. The benthic grab samples will be labeled as follows:

Benthic grab samples (BG)
Transect # (1,2,3)
Depth (2,4,6,8,10,12 m)
Date (Jan, March, May, July, Sept., Nov. 1999)
Replicate (1-3)
Example BG- 2-4m-March xx 99-R3

For the March sampling date, 2 small sediment cores will be collected from an additional grab at each site for determination of sediment particle size, 2 cores collected for organic content analysis, and 2 cores for determination of C:N ratio. For the Sept. sampling date, 4 sediment cores will be collected from an additional grab for analysis of organic content (2 cores) and C: N ratio (2 cores). Sediment cores will be labeled, placed on ice, and transferred to a freezer until laboratory analysis. Sediment samples will be labeled as follows:

Sediment analysis (SedP = particle analysis, SedO= organic analysis, C:N)
SedP-BG-4-8m-March xx 99-R1
SedO-BG-4-8m-March xx 99-R1
C:N-BG-4-9m-March xx 99-R1

Bimonthly, two replicate timed offshore macroplankton tows will be taken offshore of the State Park Headquarters during the evening hours to determine the abundance of heteronereids of *Neanthes succinea* and amplexing *Gammarus mucronatus*. The exact length of the tow will be determined during January sampling period. Use of floodlights anterior of the tow should enhance the

abundance of these organisms. Boat speed will be as slow as possible, and will not exceed 1 knot. The contents of the plankton net will be carefully washed to the cod end of the net, transferred to a suitable container, and preserved with 10% formalin. Labels will be placed both inside and outside of the container and will contain the following formation:

Macrozooplankton tows (MZT)
Date (Jan, March, May, July, Sept., Nov. 1999)
Length of tow in minutes Replicate (1-2)
Example MZT-Jan. xx,99- 10 min.-R1

4. Shoreline sampling

Bimonthly, rocky substrates at Red Hill Marina will be sampled for benthic species. Five quadrats will be collected from barnacle covered rocks, and 5 quadrats will be collected from quadrats dominated by macroscopic algae. The contents of these quadrats will be sieved through a 1000µ mesh. The contents will be transferred to a suitable labeled container, stained with rose bengal, and preserved with 10% formalin.

Red Hill Marina rocky substrates
Quadrats taken from barnacle substrates (QBS)
Quadrats taken from algal substrates (QAS)
Date (Jan, March, May, July, Sept., Nov. 1999)
Replicate (1-5)
Examples QBS-May xx-99-R4 and QAS-Nov. xx 99-R5

Bimonthly, 3 replicate samples will be collected from barnacle shell/ sand substrates at State Park Headquarters, Salt Creek, and Bombay Beach. A stainless steel coring device with a surface sample area of 0.02 m^2 will remove sediment to depth of 10 cm. The sediment will be sieved through a 1000 µm sieve, organisms will be separated from these sediments in the field using a saturated sugar solution into a suitable labeled container, and preserved with 10% formalin.

Shoreline barnacle shell/sand substrate (BS)
Location (State Park SP, Salt Creek SC, Bombay Beach BB)
Replicate (1-3)
Date (Jan, March, May, July, Sept., Nov. 1999)
Example BS- BB-July xx 99-R-3

Two replicate sediment cores will be collected during the March period for sediment particle size analysis and processed using the same techniques as described above for the grab samples.

Field notebooks will be maintained which describe all the details of each sampling effort.

B2: Sampling Methods Requirements

Sampling

Triplicate phytoplankton samples are collected using a 3 meter long PVC tube sampling device. This sampling device collects a 3m integrated sample of the water column. This method of phytoplankton collection is designed to get a full sampling of the water column (Schröder, 1969) and to ensure that even the smallest phytoplankters are captured (Wetzel and Likens, 1990). Three replicate samples are taken at each depth interval using independent casts of the sampling device. Each 50 ml sample is immediately be preserved in Lugol's solution in amber bottles.

Zooplankton will be sampled at two meter intervals using a 32 liter Plexiglas Schindler trap (Schindler, 1969) which is designed to concentrate the plankton larger than 55 µm. From our previous studies there are small plankters (rotifers) present in the Salton Sea with widths of 70-80 µm, so a larger mesh size would not be appropriate as these taxa would be lost. After collection, the sample is preserved in 5% formalin (Steedman, 1976).

B3: Sample Handling and Custody Requirements

Phytoplankton and zooplankton samples (as defined in §B1) will be stored in LS 236 at SDSU. Sample labeling is performed in the field and retained during analysis and storage. Samples collected by the SDSU plankton group for the biotic inventory will be collected, preserved, and shipped according to specified protocols given by individual researchers within in the biotic inventory. A sample custody form denoting sample specifics will be retained and cataloged.

Benthic field samples will be stored in LS 341 at SDSU, with the storage system using the same classifications as in the field samples (Benthic grabs, Benthic grab sediments, Macrozooplankton tows, Shoreline samples). Frozen samples will be stored in the LS 341 freezer. As samples are processed, preserved identified specimens will be stored by the same classification in LS 341.

B4: Analytical Methods Requirements

Phytoplankton samples will be processed with the use of a 25.4 ml settling chambers with 2.5 cm inside diameter and a settling time of 24 hours. The fixed phytoplankton will be concentrated on a coverslip of 49 mm^2 area and counted with an inverted microscope using the Utermöhl method (Lund et al., 1958). One pair of crossed diameters (18.0 mm^2 area) are counted at 400x and these counts are converted cells per milliliter by multiplying by a factor of 1.073. Phytoplankton samples will be enumerated no later than one month following collection.

Zooplankton samples are identified and enumerated in a 40mm x 50mm chamber which is divided into counting strips and the counts obtained converted to number of organisms per liter. Zooplankton samples preserved in formalin will be enumerated no later than two months following collection.

Phytoplankton samples will be analyzed for chlorophyll pigments using spectrophotometry and HPLC. Samples are filtered through 0.7 µm GF/F glass fiber filters and stored immediately in liquid nitrogen. The filters are then extracted in 90% acetone for 24 hours. 1.5 ml aliquots are removed and used for spectrophotometric analysis for chlorophyll pigments. Aliquots are measured at seven wavelengths (480, 510, 630, 664, 665, 647, and 750 λ) before and after acidification, which corrects for phaeopigments (Strickland and Parsons 1972). Aliquots are acidified using 0.15 ml of 1 N HCl. A second aliquot is removed for HPLC pigment analysis. The HPLC pigment analysis will use the method of Wright *et al.* (1991) measuring absorption at 436 and 450 λ simultaneously, and from 390 to 550 λ every 1 nm with a scanning detector.

Taxonomic determinations for the biotic inventory are the sole responsibility of each co-PI specialist. Their methodologies follow standard methods using the taxonomic literature.

Detected plankton enumeration discrepancies, improper sample collection, improper sample handling, inappropriate material disposal, or other sample failure is the responsibility of the project manager Dr. Stuart Hurlbert. He is given wide latitude to discipline (including removal from the project), and reshuffle responsibility to correct problems. Actions taken to correct sample failure are dependent upon circumstances of the failure. All failures will be reported in the quarterly reports.

Standard particle size analysis of sediments will be conducted on replicates from each site using wet weight or dry weight sieving through standard screen series: 2000, 1000, 500, 250, 125, 63, and 38µ. (Clesceri *et al* 1998) All organisms will be removed from each preserved grab sample, macroplankton sample, barnacle shell/sand sample, barnacle rock sample and algal sample and sorted to species, and counted using a dissecting microscope (Wetzel and Likens, 1990). All individuals of all species within each sample will be counted, unless they occur in very large numbers. In this case, a sub-sample will be counted. Species will be identified to the lowest taxonomic level possible, and if unknown, representative specimens will be prepared for complete identification by taxonomic specialists. Mean and median particle size diameter, sorting, kurtosis, and skewness will be determined. Another alternative to sieving is to

use the same technique as that used in the Walker 1961 studies, that is, an Emery settling tube for the sand fractions and the standard pipette method for silt and clay fractions. The Emery settling tube method, in combination with standard sieves, will be used in determination of sediment particle size for barnacle shell/sand shoreline substrates.

Sediment organic content will be determined by burning replicate samples (2/site) in a muffle furnace for 1 hour at 700ºC (Wetzel and Likens, 1990). Additional sediment samples will be dried, ground to 280µ and then examined using an Perkins Elmer elemental analyzer to determine the C:N ratio.

A laboratory notebook will be maintained and kept in LS 201 (plankton), and LS 341 (benthos) which describes details on dates of analysis, sample quantification, identification, sediment analysis, etc.

Mean and standard errors will be determined for total density of all species, and for abundant individual species in relation to depth, station, season, sediment particle size, and C:N ratio (grab samples).

During the sample processing and disposal procedures, all chemical waste that is generated (i.e. preservatives) will be collected into labeled waste containers and disposed of by EH&H at SDSU.

B5: Quality Control Requirements

Zooplankton samples will be collected in duplicate and phytoplankton samples will be collected in triplicate. Duplicate samples will be enumerated for both the phytoplankton and zooplankton samples. Check counts, by a second enumerator, will be made for both zooplankton and phytoplankton samples. 10% of samples collected from each sampling date will be counted by a second enumerator to verify species identification and number present, specifically 4 phytoplankton samples and 5 zooplankton samples.

Plankton count accuracy will be assessed by comparing the original count (c) with the recount (R) by the second enumerator. Some discrepancies are to be expected solely because often only a fraction of each sample is counted and variation is introduced by the subsampling process. Acceptable levels of error are also determined by the fact that for a population whose density varies over many orders of magnitude (spatially and temporally) it is sufficient for our purposes to have estimate accurate to, say, half an order of magnitude.

Thus we will define a sample count (C) and sample recount (R) to be in acceptable agreement with each other so long as the following criteria are met:

1) For each species where $C > 50$, then $0.5C < R < 2C$
2) For each species where $20<C=50$, then $0.32C < R < 3.2\ C$
3) For each species where $5>C=20$, then $0.2C < R < 5C$
3) For no species where $C = 0$ is $R > 5$; for no species where $R = 0$ is $C > 5$ (either situation might indicate taxonomic error)

Whenever any of these criteria are not met, the cause will be determined by joint examination of the sample in question by the two counters involved and Dr. Stuart H. Hurlbert, and by review of procedures. The need for further actions, such as recounting of an entire set of samples, would be determined by conclusions reached as to the nature and magnitude of any errors committed.

Replicate benthic samples will be taken for all parameters studied including triplicate benthic grab samples, duplicate macrozooplankton tows, duplicate sediment samples, triplicate barnacle sand/shell shoreline samples, 5 replicates for barnacle quadrats, and 5 replicates for algal quadrats. To verify identifications, counts, etc. one member of the team (Coe, Detwiler, Dexter) will separately count and identify at least one sample of each type of sample collected on each sampling date.

B6: Instrument/Equipment Testing, Inspection, Maintenance

Periodic (i.e. bi-monthly) re-calibrations will be made for each microscope using a stage micrometer. All field equipment will be cleaned thoroughly after each sampling period to prevent corrosion of samplers and possible clogging of mesh used with the Schindler trap. A second sampler for zooplankton is available for spare parts and possible temporary replacement.

Phytoplankton samples will be checked quarterly for Lugol's solution degradation. Lugol's solution will be added to samples at this time if appropriate.

B7: Instrument Calibration and Frequency

NA

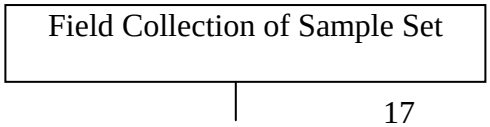
B8: Inspection/Acceptance Requirements for Supplies and Consumables

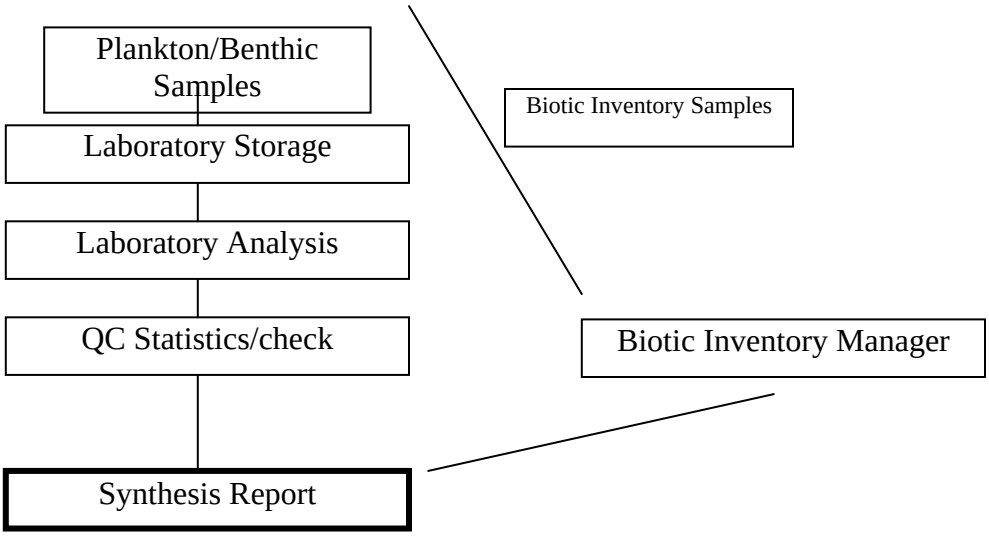
NA

B9: Data Acquisition Requirements (Non-direct Measurements)

NA

B10: Data Management





Plankton and benthic data are recorded and stored both electronically and in hard copy. The hard copy data are centrally stored, and stored with each sample set. Electronic copies are well annotated and centrally stored. The third non-enumerated phytoplankton sample is stored as an archive sample. All samples are stored, moved, and analyzed together by date as a sample set. Each sample within a sample set is individually labeled by sample set, sample station, depth, and replicate. Each field sample that is collected is indicated on an accompanied on a field sampling data sheet. Zooplankton samples are stored for further analysis. All samples are stored at SDSU. Copies of field sampling forms, counting forms for zooplankton and phytoplankton, statistical work up sheets, and custody forms are provided as attachments at the end of this document.

The analysis of field data will follow the guidelines specified above (§ B4). All enumeration data for both phytoplankton and zooplankton will be entered into a computer to allow appropriate statistical analyses to be performed.

C: Assessment/Oversight

C1: Assessments and Response Actions

Quarterly assessments, specified earlier, will be used to maintain quality control within the project. The project officer, Dr. Doyle Stephens, and the QA/QC coordinator, Dr. Barry Gump, will undertake these assessments.

Dr. Stuart H. Hurlbert and Dr. Deborah Dexter will maintain constant quality control surveillance. Dr. Stuart H. Hurlbert will be responsible for all oversight and implementation of appropriate action to correct discrepancies as he sees fit. Individual actions will be based upon the specific circumstances of the oversight.

C2: Reports to Management

Bi-monthly progress reports will be created documenting the progress of each section of the project towards the project goal. Said bi-monthly reports will be delivered to the Salton Sea Science Subcommittee through Dr. Doyle Stephens, the project officer.

Dr. Stuart H. Hurlbert will be responsible for compilation of the document and for delivery. He will take necessary and appropriate action for delinquent progress report from other PIs on this project.

D. Data Validation and Usability

D1: Data Review, Validations, and Verification Requirements

Plankton data taken over time are highly variable. For each sample set true replicates are taken to allow for the calculation of mean abundance, standard deviation, and confidence intervals within the sample set to be calculated. The quality of these values is ensured with the procedures described in §B5.

Benthic densities and species numbers are highly variable, and accepted protocol is to state the means and standard errors of the estimates.

D2: Validation and Verification Methods

The individual co-PIs of the biotic inventory are responsible for the data and samples at all times. Samples are collected by the field crew and are not considered field crew custody at any time. Each taxonomic specialist is responsible for specifying sampling methods and handling instructions.

Validation and verification of plankton samples is the sole responsibility of Dr. Stuart H. Hurlbert. Dr. Deborah Dexter will be responsible for validation of the benthic data. As the project managers they will ensure that samples and data are taken, handled, and analyzed appropriately (see §B10). Any perceived oversight will be handled appropriately by them, including stop project orders, relief of duty, and reshuffling of responsibility.

Validated analyses will be submitted to the Salton Sea Science Subcommittee by Dr. Stuart H. Hurlbert through Dr. Doyle Stephens in the form of monthly progress reports and a final synthesis report.

D3: Reconciliation with User Requirements

The data gathered by this investigation will provide a comprehensive biotic inventory list of the selected taxa at the Salton Sea. In the cases of the phytoplankton and zooplankton seasonal species composition will also be elucidated. The data on the benthos will be used to describe the current benthic

environment at the Salton Sea. The project participants reserve the right to publish these data in the scientific literature. All data gathered by this investigation will also be used to determine areas where further research is needed. The adequacy of the data gathered to describe the Salton Sea biota will be determined through individual assessments by the co-PI(s).

The results of the study will conform to the proposal submitted by the group to the Salton Sea Science Sub-committee (SSSS) in the RFP process. This proposal outlines the objectives and goals of the project as approved by the SSSS. The group involved in sampling, handling, and analyzing the data are trained individuals. By working within the context of the aforementioned quality control methods the data provided in the final reports will be valid, contingent upon the QC guidelines specified above.

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Salton Sea Plankton Sampling Log

Recorder & Crew : _____
_____

Weather: _____ Date : _____
_____

Notes: _____

Station #1 Time: _____
Air Temp: _____
Secchi Depth: _____

Phytoplankton Samples:

Depth	Sample ID	Replicate
0 - 3 M	_____	A, B, C
3 - 6 M	_____	A, B, C
6 - 9 M	_____	A, B, C

Zooplankton Samples:

Depth	Sample ID	Replicate
0.5 M	_____	A, B
2.5 M	_____	A, B
4.5 M	_____	A, B
6.5 M	_____	A, B
8.5 M	_____	A, B
10.5 M	_____	A, B
12.5 M	_____	A, B

Station #2 Time: _____
Air Temp: _____
Secchi Depth: _____

Phytoplankton Samples:

Depth	Sample ID	Replicate
0 - 3 M	_____	A, B, C
3 - 6 M	_____	A, B, C
6 - 9 M	_____	A, B, C

Zooplankton Samples:

Depth	Sample ID	Replicate
0.5 M	_____	A, B
2.5 M	_____	A, B
4.5 M	_____	A, B
6.5 M	_____	A, B
8.5 M	_____	A, B
10.5 M	_____	A, B

Station #3 Time: _____
Air Temp: _____
Secchi Depth: _____

Phytoplankton Samples:

Depth	Sample ID	Replicate
0 - 3 M	_____	A, B, C
3 - 6 M	_____	A, B, C
6 - 9 M	_____	A, B, C

Zooplankton Samples:

Depth	Sample ID	Replicate
0.5 M	_____	A, B
2.5 M	_____	A, B
4.5 M	_____	A, B
6.5 M	_____	A, B
8.5 M	_____	A, B
10.5 M	_____	A, B

Station #4 Time: _____
Air Temp: _____
Secchi Depth: _____

Phytoplankton Samples:

Depth	Sample ID	Replicate
0 - 3 M	_____	A, B, C
3 - 6 M	_____	A, B, C

Zooplankton Samples:

Depth	Sample ID	Replicate
0.5 M	_____	A, B
2.5 M	_____	A, B
4.5 M	_____	A, B
6.5 M	_____	A, B

Station #5 Time: _____
Air Temp: _____
Secchi Depth: _____

Phytoplankton Samples:

Depth	Sample ID	Replicate
0 - 3 M	_____	A, B, C
3 - 6 M	_____	A, B, C

Zooplankton Samples:

Depth	Sample ID	Replicate
0.5 M	_____	A, B
2.5 M	_____	A, B
4.5 M	_____	A, B
6.5 M	_____	A, B

VOL. SETTLED	DEPTH:	POWER:	COUNT DATE:
SAMPLE DATE:	LOCATION:		COUNTER:
PORTION OF SAMPLE COUNTED IF OTHER THAN 2 CROSSED DIAMETERS:			
COMMENTS:			

Taxon/category	diameter 1	diameter 2	total	#/mL
Gyrodinium uncatenum				
Gymnodinium sp. 1				
Gymnodinium sp. 2				
Heterocapsa niei				
Prorocentrum minimum				
Oxyrrhis marina				
Gonyaulax grindelyi				
Gonyaulax cf. *spinifera*				
Scrippsiella sp.				
Oblea sp.				
tiny dinoflagellate				
Thalassionema nitzschioides				
Chaetoceros muelleri				
Tryblionella punctata				
Cyclotella sp. >7µm single				
Cyclotella sp. >7µm chains				
Cyclotella < 7µm				
Pleurosigma sp.				
Nitzschia frustulum				
Cylindrotheca closterium				
Oocystis sp.				
Crucigenia rectangularis				
Chattonella cf. *marina*				
Chrysochromulina sp.				
coccolithophore				
Eutreptia lanowii				
large flagellates				
small flagellates				
large *Euplotes*				
Fabrea salina				
Condylostoma spp.				
Strombidium sp.				
tintinnids				
other large ciliates				
small ciliates				
OTHER TAXA				

VOLUME FILTERED (L) DEPTH: POWER: COUNT DATE:

SAMPLE DATE: LOCATION: COUNTER:

PORTION OF SAMPLE COUNTED (IF OTHER THAN FULL CHAMBER OR STRIPS INDICATED)_____

COMMENTS:

Taxon/category	1	2	3	4	5	6	7	8	9	10	11	12	13	total	#/L
ROTIFERA															
Synchaeta sp. (large)															
Synchaeta sp. (small)															
Brachionus rotundiformis															
POLYCHAETA															
Neanthes succinea															
Neanthes succinea eggs															
CRUSTACEA															
Balanus amphitrite nauplii															
Balanus amphitrite cypris															
Apocyclops dengizicus															
Apocyclops dengizicus nauplii															
CILIOPHORA															
FISH EGGS															
OTHER TAXA															