

Seagrass Resources and Condition Within Padre Island

National Seashore, Texas: A GIS Analysis

Christopher P. Onuf and Jaimie J. Ingold

U.S. Geological Survey, National Wetlands Research Center,

6300 Ocean Drive, USGS – Unit 5838

Corpus Christi, TX 78412-5838

Telephone 361-985-6266, FAX 361-985-6268

Email: chris_onuf@yahoo.com, jaimie_ingold@usgs.gov

Final Report for Element 1 of a project to:

Assess Condition and Trend of Seagrass Communities in Laguna Madre, Padre Island National Seashore (PAIS), Most at Risk from Channel Dredging, Oil and Gas Exploration, and Recreational Fishing Activities

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Abstract

A survey of the seagrass resources of Padre Island National Seashore was conducted in fall 2002 and 2003, with additional sampling through 2006 to resolve questions. GIS overlays on U.S. Geological Survey orthophoto quads were made of depth with respect to mean sea level and frequency of occurrence of seagrass out of five samples collected for every station sampled. These data were used to draw boundaries of area submerged at mean sea level and seagrass meadow, in relation to the boundary of the National Seashore. Frequency of seagrass occurrence, mean plant height, shoot density, plant height * shoot density, live biomass, and dead biomass on a 1' latitude by 0.25' longitude grid were collected and their distribution plotted in space and according to depth.

Seagrasses covered almost two-thirds of the regularly flooded part of Laguna Madre within the borders of the seashore. Comparisons with earlier surveys showed that substantial areas of seagrass cover had been lost in deep water between 1988 and 1998 as a result of a persistent phytoplankton bloom, and little recovery has occurred since. Maximum depth of seagrass occurrence responded to changes in water clarity. In contrast, much of the cover at shallow to intermediate depths lost at the south end of the study area between 1988 and 1998 was replaced by 2003. The seven stations with greatest plant height all were located in this area of recent recolonization. Continuity of cover as measured by frequency of occurrence was high except near the edge of seagrass meadow. Decrease in this measure may be an indicator of meadow fragmentation,

signaling deterioration of seagrass meadow before loss. The other measures of condition were so variable as to be insensitive indicators of impending change.

Introduction

Padre Island National Seashore is best known for its 60 miles (100 km) of little-disturbed beach and sand dunes facing the Gulf of Mexico. Less well known is its even longer shore on the west side of the barrier island and the $\sim 39 \text{ mi}^2$ (101 km^2) of Laguna Madre's waters that lie within the park. Laguna Madre is a natural wonder in its own right, being one of only five hypersaline ecosystems in the world (Javor, 1989).

Seagrasses carpet most of the bottom and are the foundation of a highly productive environment. Because seagrasses introduce a lot of physical structure and absorptive surface into the water column, they are highly effective filters of suspended particles and nutrients in the water column (Short and Short, 1984), baffle waves and stabilize bottom sediments (Fonseca, 1989), and provide sanctuary from large predators for the young of commercially important species (Rooker and others, 1998).

In general, epiphytic algae and other organisms growing on the large, complex, self-renewing surface area provided by growing seagrass leaves support the dense and diverse assemblage of consumers associated with seagrass meadows (Moncreiff and Sullivan, 2001); however, there are a few direct consumers of seagrasses that pose significant concerns to management of Padre Island National Seashore. Three-quarters of the world

population of redhead ducks (*Aythya americana*) overwinter on the Laguna Madre ecosystem of southern Texas and northern Mexico (Weller, 1964). While in residence, the redheads feed almost exclusively on the rhizomes of one seagrass species, shoal grass (*Halodule wrightii*) (McMahan, 1965-67; Cornelius, 1977; Woodin, 1996; Woodin and Michot, 2002). Approximately 9 percent of the lagoon's total seagrass coverage lies within the park boundary and 15 percent of the lagoon's *Halodule* coverage. Juvenile green turtles (*Chelonia mydas*) feed primarily on seagrasses. Historically, green turtles were the leading marine product of lower Laguna Madre. Recently, the few reports of green turtles from within the lagoon have been from gill net surveys conducted by the Texas Parks and Wildlife Department, with five reports for lower Laguna Madre and only one for upper Laguna Madre (Smith and Childs, 2002), indicating that the lagoon is not heavily used by green turtles now, but it has the potential to be. Additionally, manatees (*Trichechus manatus*) are direct consumers of seagrasses that occur in Laguna Madre. So far, they show up briefly as solitary individuals, but, if warming trends continue, they may occur more frequently and for longer periods.

Subtidal and regularly flooded portions of Laguna Madre comprise as much as a quarter of the area of Padre Island National Seashore. Most of this area is or potentially could be covered by seagrass meadow. Because of the large but imprecisely documented extent and many valuable services provided by seagrass meadows in the park, staff needs a detailed inventory of the extent and condition of this resource within the boundaries of the park to guide management. In this study, we have capitalized on past efforts by supplementing the existing array of transects, by adapting the methods already in use by

the U.S. Geological Survey (USGS) (Quammen and Onuf, 1993; Onuf 1996a,b, 2000), and by adding a major GIS component.

Methods

Distribution. To characterize the park's seagrass resources adequately, the array of 6 transects within Padre Island National Seashore sampled in 1988 and 1991-98 was expanded to 35 east-west transects at 1' intervals of latitude, with stations at 0.25' intervals of longitude (fig. 1). Actual locations sampled were determined by using a Precision Lightweight GPS Receiver (Rockwell PLGR) with error <10 m. Four 80-cm² by 15-cm deep cores with plants were collected at each station ~2.5 m apart along the port side of the boat. For each core and the anchor, all seagrass species, algal presence, and the dominant contributor to vegetative cover were assessed by visual inspection and recorded. Where a meadow boundary was crossed or dominant seagrass species changed between stations, the interval between stations was progressively decreased and cores collected until the boundary was determined to within 0.01' of longitude. Time and depth were recorded at each station, and depths were standardized by adjusting measured depth according to the deviation from mean sea level at sampling time for the Texas Coastal Ocean Observation Network tide gauge at Bird Island, located toward the north end of the study area. The planned transect sampling was carried out between October and December in 2002 and

2003. Additional sampling to resolve questions about distribution was conducted as needed through October 2006.

Condition. Shoot density and length were chosen as the most useful measures of condition in this study rather than biomass, because they can be relatively quickly determined in the field. The more labor-intensive use of biomass would be cost-prohibitive to achieve the same level of coverage. Shoots were counted for each species present in all cores collected at the predetermined sampling stations (fig. 1). Too many seagrass leaves are cut off by the coring device to reliably determine shoot length from plant material retrieved in cores. Therefore, a post hole digger with handles extended with a length of PVC pipe was used to tear a section of seagrass turf from the bottom in the vicinity of each core sample, and the longest shoot was measured from rhizome to tip with a plastic ruler.

Biomass. To allow comparisons with other studies, biomass was determined for a limited subset of samples collected. One core sample randomly selected from the four collected at every other station along each transect (0.5' longitude intervals, open circles in fig. 1) was retained for biomass determination. As per Onuf (1996b), samples were washed on 1-mm mesh screens. All plant material retained on the screens was placed in plastic bags and stored on ice for transport to the laboratory where the samples were frozen until processed. Processing consisted of thawing and separating into live (turgid green, white to beige, and pink structures) and dead (flaccid brown to washed-out maroon) fractions. The live fraction was sorted further according to species and into aboveground

(green portions of shoots) and belowground (root, rhizome, and unpigmented portions of shoots) fractions. The sample fractions were dried to constant weight at 60°C (72 hours), weighed, ashed at 530°C for 1 hour, and weighed again. Dry weight and ash-free dry weight were calculated for all plant parts and dead material. Station biomass determinations were reported on a per meter squared basis, and these were used to compute mean biomass for each species where present and for the whole study area. Regressions between biomass and shoot density * height were used to investigate whether shoot density * height can serve as a surrogate for biomass.

Data processing and GIS analysis. Data on location, depth, and number of cores with seagrass cover were compiled in a Microsoft® Excel® spreadsheet for all sites visited, along with date and approximate time of sampling. Using a record of hourly water level for the Texas Coastal Ocean Observation Network (<http://lighthouse.tamucc.edu/pquery>) for their South Bird Island platform and the mean sea level datum for that station, depths were referred to mean sea level. Location coordinates were recorded to thousandths of minutes of latitude and longitude and converted to decimal degrees (minus decimal degrees for longitude) for import into ArcView™ (Environmental Systems Research Institute, Inc.). The seagrass core frequency data were developed as a theme in ArcView™ and overlaid on USGS digital orthophoto quarter quads. Boundaries of the seagrass meadow were drawn interpolating between determined boundary locations using features in the aerial imagery where useful. The shapefiles so created were used to display the results of the survey visually and to compute the area of seagrass cover. All location data were projected in NAD_1983_UTM_Zone_14N.

The data for mean shoot density, mean shoot length, and mean shoot density * mean shoot length sampled at 1' latitude by 0.25' longitude intervals were normalized for map display by computing the value of each measure for each station as a percent of the maximum value sampled in the study and expressing it in a scale from 0 to 9, where 0 corresponds to the interval from 0 to <10 percent of the maximum found in the study, 1 corresponds to the interval from 10 to <20 percent, and so on. These measures were then developed as themes in ArcView™ as done for the distribution data and displayed as overlays of the orthophoto quads in ArcView™, and they were also developed as hardcopy outline maps.

The same approach was used to display the data for biomass at 1' latitude by 0.5' longitude intervals. In addition, depths with respect to mean sea level for all stations sampled and at the edges of seagrass meadows were developed as ArcView™ themes for possible application in management.

Directions for displaying data in ArcView™.

ArcView™ GIS projects Seagrassdistribution.apr and Seagrasscondition.apr.

Projects were created using ArcView™ GIS version 3.3. The folder "paisgis", located on the accompanying CD, contains both projects and the various files associated with each.

Opening Seagrassdistribution.apr:

1. Copy the folder "paisgis" from the CD to the root (C:) drive of the computer being used.
2. Open ArcView™ GIS version 3.3 or higher (3.3 works best).
3. Click "file".

4. Click “open project”.
5. Select the (C:) drive.
6. Open the folder “paisgis” located on the (C:) drive.
7. Select Seagrassdistribution.apr and click “OK”.

Seagrassdistribution.apr contains one view (View1), which is now open. View1 is made up of 8 themes and 14 USGS digital orthophoto quarter quads. Themes can be overlaid independently or together as layers on the photo quarter quads. The following eight themes are located in the column (Table of Contents) to the left of the view.

 Boundary.shp – Padre Island National Seashore western boundary within Laguna Madre.

 Mapticks.shp – White crosses represent associated latitude and longitude.

 Seagrass.shp – Red polygons represent the area of seagrass meadow within the boundaries of Padre Island National Seashore.

 Noseagrass.shp – Yellow polygons represent the area without seagrass in the sub tidal portion of Laguna Madre within the boundaries of Padre Island National Seashore.

 Waterarea.shp – Green polygons represent estimated mean sea level of Laguna Madre within the boundaries of Padre Island National Seashore.



 Coresamples.shp – Colored squares represent stations where seagrass samples were collected.



 Alldepth.shp – Green circles with associated depths (cm) with respect to mean sea level for all locations sampled, - means above mean sea level.

 Edgedepth.shp – Blue circles with associated depths (cm) with respect to mean sea level for edges (shallow or deep) of seagrass meadow, - means above mean sea level.

Activating and displaying themes:

Click the name of the theme you want to make active. When a theme is active, it appears highlighted (raised up) in the Table of Contents. Editing a theme, viewing the theme's table or properties, can only be done when the theme is active. The checkbox next to the theme name is used to turn the theme on or off (display within the view or not display within the view). All themes can be made active by clicking on the theme's name. All

themes can be turned on or off by clicking the box to the left of the theme name. Seagrass.shp is currently active (appears raised) and is turned on (box is checked).

1. Click the box to the left of Noseagrass.shp to turn on this theme.
2. Click the box to the left of Seagrass.shp to turn it off.
3. Click on the theme name Noseagrass.shp to make it active.
4. Click on the theme name Seagrass.shp to make it active.
5. Click on the box to the left of Noseagrass.shp to turn it off; click on the box to the left of Seagrass.shp to turn it back on.

All themes can be turned on and off or activated and deactivated in this manner. A theme does not have to be active to be turned on (box checked).

The bar at the top of the screen contains two rows of various buttons and tools used to work with the features of a theme. The buttons make up the top row; the tools are in the bottom row. The name of a particular button or tool can be viewed by resting the pointer on it.

Explanation and use of themes:

-  Boundary.shp
- 

1. Click the box to the left of Boundary.shp to turn on this theme.

 Mapticks.shp

White crosses represent associated latitude and longitude.

1. Click the box to the left of Mapticks.shp to turn on this theme.

 Seagrass.shp

Red polygons represent the area of seagrass meadow within the boundaries of Padre Island National Seashore. All polygons in this project are identified by a number displayed within or next to the polygon.

The “Zoom In” tool  is required to properly interpret some themes.

1. Click the “Zoom In” tool.
2. Using the mouse, place the “Zoom In” tool in the upper left section of the area you wish to magnify.
3. Hold down the left mouse button and drag a box over the area of interest.
Release the mouse button when the desired box is drawn.
4. If a mistake is made, locate and click the “Zoom to Full Extent” button to return to a

full view of the project.

5. Repeat step three and zoom in again.
6. Click the pointer tool.
7. Use the pointer to identify the “Zoom to Previous Extent” and “Zoom to Full Extent” buttons.
8. Click the “Zoom to Previous Extent” button to return to the previous view size.
9. Click the “Zoom to Full Extent” button to return to a full view of the project.

The “Pan” tool  lets you pan the view by dragging the display in any direction with the mouse.

1. Click the “Zoom In” tool and use it as described previously to zoom in on a particular area of the view.
2. Click the “Pan” tool.
3. Place the “Pan” tool anywhere over the view, hold down the left mouse button, and drag in any direction. Release the mouse button to leave the view in your desired position.
4. Click the “Zoom to Full Extent” button to return to a full view of the project.

Themes Seagrass.shp and Noseagrass.shp have associated tables. Tables identify each polygon by number and provide the following information for each polygon: Area (km²), Perimeter (km), Acres, and Hectares. Tables can be exported to spreadsheets for manipulation and analysis.

“Open Theme Table” button

1. Use the pointer to identify the “Open Theme Table” button.
2. Click the “Open Theme Table” button to view the table for Seagrass.shp.

Exporting tables

3. With the table open, click “file”.
4. Click “export”.
5. Click “dBASE” as the export format you wish to use and click “OK”.
6. Select the directory and folder where you would like to save the table.
7. Click “OK”.
8. Click the X box in the upper right corner of table to close the table.

“Theme Properties” button

A brief description of the active theme can be viewed in the Comments Box of the Theme Properties.

1. Use the pointer to identify the “Theme Properties” button
2. Click the “Theme Properties” button to view a description of Seagrass.shp.
3. Close the “Theme Properties” box.

 Noseagrass.shp

Yellow polygons represent the area without seagrass in the subtidal portion of Laguna Madre within the boundaries of Padre Island National Seashore.

1. Click the box to the left of Noseagrass.shp to turn on this theme.
2. Click the theme name Noseagrass.shp to make it the active theme.
3. Use the “Zoom In” tool to look at areas of interest and “Zoom to Full Extent” when finished.
4. Click the “Open Theme Table” button to view the table for Noseagrass.shp and close the table when finished.

 Waterarea.shp

Green polygons represent estimated mean sea level of Laguna Madre within the boundaries of Padre Island National Seashore.

1. Click the box to the left of Waterarea.shp to turn on this theme.



 Coresamples.shp



Each square represents a station where seagrass samples were collected. The white squares represent no seagrass present in samples. The green squares represent seagrass present in one or two samples out of four or five possible. The red squares represent seagrass present in more than two samples out of four or five possible. The “Zoom In” tool is required to properly interpret this theme.

1. Click the box to the left of Coresamples.shp to turn on this theme and click the theme name to make it active.
2. Use the “Zoom In” tool to drag a box over an area of interest.
3. Repeat step two until desired separation of sampling stations of interest is achieved.
4. Click “Zoom to Full Extent”.
5. Turn off Coresamples.shp.

 Alldepth.shp

Green circles with associated depths (cm) with respect to mean sea level for all locations sampled, - means above mean sea level. The “Zoom In” tool is required to properly interpret this theme.

1. Turn on Alldepth.shp.
2. Use the “Zoom In” tool to achieve desired separation for depths of sampling locations.

3. Click “Zoom to Full Extent”.
4. Turn off Alldepth.shp.

● Edgedepth.shp

Blue circles with associated depths (cm) with respect to mean sea level for edges (shallow or deep) for seagrass meadow, - means above mean sea level. The “Zoom In” tool is required to properly interpret this theme.

1. Turn on Edgedepth.shp.
2. Use the “Zoom In” tool to achieve desired separation of depths at edges.
3. Click “Zoom to Full Extent”.
4. Turn off Edgedepth.shp.

Close project Seagrassdistribution.apr.

1. Click “file”, “close”, “file”, “close project”. Do not save changes.

Seagrasscondition.apr

This project was created for the purpose of displaying seagrass condition data as overlays of the orthophoto quads. These data are also provided as hardcopy outline maps. Seagrasscondition.apr contains two views: SeagrassConditionNorth and SeagrassConditionSouth. Each view contains the following six themes, which are designed to be turned on and viewed independently with no magnification required.

Continuity.shp – Number of samples out of a possible four or five with seagrass.

Shootlength.shp – Mean shoot length.

Shootdensity.shp – Mean shoot density.

Lengthxdensity.shp – Mean shoot length multiplied by mean shoot density.

Biomasslive.shp – Live biomass.

Biomassdead.shp – Dead biomass

Mean shoot length, mean shoot density, mean shoot length* mean shoot density, and biomass data were normalized for map display by computing the value of each measure for each station as a percent of the maximum value sampled in the study and expressing it in a scale from 0 to 9, where 0 corresponds to the interval from 0 to <10 percent of the maximum found in the study, 1 corresponds to the interval from 10 to <20 percent, and so on.

Seagrasscondition.apr can be opened and data displayed by following the procedures listed above for opening and displaying data in Seagrassdistribution.apr.

Results

Distribution. Based on surveys at 1' intervals of latitude, supplemented with additional sampling where boundaries were in question, seagrasses cover 6,284 ha (15,528 ac) of Laguna Madre bottom within Padre Island National Seashore. This amounts to ~62 percent of the area of the lagoon below mean sea level in the park (10,194 ha, 25,190 ac). At the north end of the park, from 27°32' to 27°28'N, seagrass cover, exclusively of *Halodule wrightii*, was continuous from shore to the western boundary of Padre Island National Seashore at the Gulf Intracoastal Waterway (GIWW), except for narrow bare strips along the shore of Padre Island and other natural (North and South Bird Islands) and artificial islands (mostly formed from dredged material deposits along the GIWW). (ArcView, C:\paisgis\seagrassdistribution.apr), turn on themes Boundary.shp, Mapticks.shp, Noseagrass.shp, Coresamples.shp, Waterarea.shp, zoom in on top three rows of map ticks (white crosses) at north end as per "Zoom In" tool directions in Methods section. Red and green squares show where seagrass was found in sampling, and seagrass meadow is outlined in red. Bare areas within the boundaries of the seagrass meadow are shown in yellow. The western boundary of the park is depicted with a dotted blue line, and estimated mean sea level is shown in green).

Use the pan tool (hand icon) to drag the view to include map ticks 27°28' to 27°24'. South from 27°28' to 27°26', the western edge of the seagrass meadow ended east of the

GIWW in relatively deep water. In order to view depths at the edges of the seagrass meadow, turn on Edgedepth.shp. To view depths of all stations sampled, turn off Edgedepth.shp and turn on Alldepth.shp. It will be necessary to zoom in further as described in the Methods section to read depths in many cases. From 27°26' to 27°24' in the area known as Big Cove, seagrass cover was again continuous from the Padre Island shore to the western boundary of the park in depths <150 cm m.s.l. Turn off Alldepth.shp.

Use the pan tool (hand icon) to drag the view to include map ticks 27°24' to 27°20'. In this segment, large areas of deep water were unvegetated, with seagrass mostly confined to a narrow band along the Padre Island shore and a finger of seagrass extending south to near 27°22' near the western boundary. At the south end of the segment, the seagrass meadow broadened over the shoal area opposite Point of Rocks.

Use the pan tool (hand icon) to drag the view to include map ticks 27°20' to 27°16'. At 27°20' the western boundary of the Seashore turns due east for 1.7 km. Only a narrow strip of shoal water opposite the mouth of Baffin Bay lies within the National Seashore in this segment. Seagrass cover extended from close to estimated mean sea level to the western boundary of the park except over a light sand body at 27°18'.

Use the pan tool (hand icon) to drag the view to include map ticks 27°16' to 27°12'. Seagrass cover in this segment was continuous to the western boundary of the park to

near 27°13', where it constricted to a narrow strip bordering on a broad expanse of deep water at Yarborough Pass, near 27°12'.

Use the pan tool (hand icon) to drag the view to include map ticks 27°12' to 27°08'. The narrow belt of seagrass adjacent to deep water extended to 27°11' and then expanded over a broad shoal area interrupted by abandoned channels and spoil islands, known as Middle Ground. Two small beds of widgeon grass (*Ruppia maritima*) were found in an otherwise bare shoal area near 27°09', close to the western boundary (red polygons 2 and 3). At 27°08' the shallow bare zone increased greatly in width and extended almost to the western boundary.

Use the pan tool (hand icon) to drag the view to include map ticks 27°08' to 27°04'. Between 27°08' and 27°06' the shallow bare zone narrowed around an area of deeper water known as Nine-Mile Hole. Two extensive bare areas were found within the seagrass meadow at moderate depths between 27°06' and 27°04'.

Use the pan tool (hand icon) to drag the view to include map ticks 27°04' to 27°00'. The southern limit of seagrass within the park was close to 27°00'. Cover was continuous to the western boundary. The shallow bare zone was narrow at 27°04' and was much broader at the south end.

Changes in Distribution Over Time. In addition to the survey of seagrass distribution within the boundaries of Padre Island National Seashore conducted for this study in

2002-03, four other surveys of the whole lagoon provide less precise information on seagrass distribution within the park at earlier dates (mid-1960s from McMahan (1965-1967), mid-1970's from Merkord (1978), 1988 from Quammen and Onuf (1993), and 1998 from Onuf (in press)), as compiled in similar format in Onuf (in press). According to this treatment, in the mid-1960s, seagrasses were absent between 27°20' and 27°25'N and south of 27°12'N (fig. 2, left). In the mid-1970s, the extreme south was completely vegetated (in Nine-Mile Hole), as was much of the eastern shore in the more northerly bare area of the 1960s (fig. 2, middle left). In 1988, seagrass cover in Nine-Mile Hole was less than in the 1970s but was almost continuous north of 27°20'N (fig. 2, middle). In 1998, the extent of bare bottom was greater in both areas than it had been in 1988 (fig. 2, middle right). In 2002-03, cover was greater in the south end than it had been in 1998, but some previously vegetated areas in the northern part of Nine-Mile Hole were again bare (fig. 2, right).

Condition. Maximum and minimum depth of occurrence. The depth at the outer (deeper) edge of seagrass meadow tended to increase toward the north end of the study area (fig. 3). Depths at the shallow edge were mostly between 0 and 0.5 m m.s.l., except from 27°23' to 27°28'N, where they were >1 m. *Ruppia* was dominant only at depths <0.2 m m.s.l.

Continuity of Cover. Where seagrass occurred, cover tended to be continuous. Of 80 stations in the 1' latitude by 0.25' longitude sampling grid where any seagrass was found, 57 (71 percent) had seagrass in all 5 samples collected (fig. 4). Most of the stations where

seagrass was present (albeit not in every sample) were in the southern section (20 south, 4 north). Most were near a meadow edge (adjacent to a station without seagrass or to shore, 17 of 23 stations (fig. 4)). The majority (59 percent) of stations with seagrass in all five cores were in the depth range 0.6-1.5 m m.s.l., whereas only 20 percent of stations with fewer or no cores with seagrass were in that intermediate depth range (fig. 5).

Shoot Length. The height of seagrass plants was bimodal in distribution. Shoot lengths at most stations were either 50-60 percent of the maximum found in the study (18 stations) or 20-40 percent of the maximum (31 stations) (fig. 6). Plant height was quite uniform at intermediate shoot lengths in the northern third of the study area, quite uniform at short shoot lengths in the middle third, and exceedingly variable in the southern third of the study area (fig. 6). Plants were short in shallow water, tallest at depths of 70-80 cm, and intermediate in height in deeper water (fig. 7).

Shoot Density. Spatial differentiation was not as strong in shoot density as in shoot length. All four high-density stations were located in the middle third of the study area, and most of the lowest-density stations were located in the south (fig. 8). Density was extremely variable at shallow stations and more uniform at intermediate densities in deeper water (fig. 9).

Shoot Length*Shoot Density. Average shoot length * shoot density provides a measure of the relative volume of water column occupied by seagrass at different locations (fig. 10). Most stations in the north segment of the study area were low-

intermediate for this measure (30-50 percent of the maximum found in this study at 19 of 34 stations), whereas values in the south segment tended to be lower (0-30 percent of the maximum at 24 of 40 stations) or higher (>50 percent of the maximum at 11 of 40 stations), as compared to only 5 of 40 stations in the 30-50 percent of maximum range. Lowest values of plant height * density occurred in shallow water, but relatively high values were reached there as well. Highest values occurred at intermediate depths and intermediate values at depths >1 m (fig. 11).

Biomass – live. Highest live biomass values occurred at one station in the north section and one location in the south (fig. 12). Otherwise, live biomass ranged from low to intermediate values with no clear pattern. Lowest biomass values occurred at shallow and deep sites; highest biomass values occurred at intermediate depths but were highly variable across the whole depth range (fig. 13).

Biomass – dead. Dead biomass was somewhat higher in the north than the south (fig. 14). The one high value was near the middle of the study area—just north of Yarborough Pass. Dead biomass tended to be twice as great as live biomass (figs. 15 and 12) but was distributed similarly with respect to depth.

Biomass in Relation to Other Measures of Condition. Average shoot density and average plant height at different sample sites accounted for some of the variation in biomass encountered in the study ($r^2 = 33$ percent and 38 percent, respectively, table 1).

The product of average shoot density and average plant height had greater predictive value of biomass ($r^2 = 59$ percent, table 1).

Discussion

Seagrasses cover 6,284 ha or >60 percent of the bottom of Laguna Madre below mean sea level within the boundaries of Padre Island National Seashore. Although four previous surveys of seagrasses in Laguna Madre encompassed the part within Padre Island National Seashore, differences between surveys in methodologies used, accuracy of boundary determinations, interpretation of the extent of the regularly submerged part of the lagoon, and intensity of groundtruthing preclude quantitative assessments of change over time. The definition of the landward limit of regular submergence and seagrass cover is especially problematic in the areas of vast wind-tidal flats on the east side of Padre Island opposite Point of Rocks from 27°21' to 27°18'N and north from Nine-Mile Hole at 27°00' to 27°10'N, most apparent in the lobe of upland south of 27°10'N extending beyond the western boundary of Padre Island National Seashore in the 1960's and 1988 surveys, which was determined to be shallow bare or seagrass covered in the surveys of 1998 and 2002-03 (fig. 2). The reason for this difference in classification is that the area is extremely difficult to access and is exposed for much of the year. Sampling for the 1998 and 2002-03 surveys was purposely scheduled for the fall period of predictable high water in the lagoon. Although undetectable in aerial photographs, very sparse seagrass was found over much of the area. This area was not

sampled in the earlier surveys. In addition, approximate mean sea level could be determined for the last two surveys by adjusting depths measured at sample locations by deviation from mean sea level at the same time at the TCOON water level monitoring station near South Bird Island. Despite the greater accuracy and precision of these surveys, considerable uncertainty remains in interpolating mean sea level between sampling transects in the absence of signatures in digital orthophotoquads.

Although quantitative estimates of changes between surveys are not warranted, some major qualitative changes in distribution are evident that far exceed what can be accounted for by methodological differences. At the south end of the study area, seagrass cover was absent in the 1960s, continuous in the 1970s, and has been a shifting mosaic since (fig. 2). The maximum depth of this part of the lagoon is <1 m m.s.l. The other section of the lagoon in which major changes in seagrass cover have occurred is north from $27^{\circ}20'$ to $27^{\circ}25'$ N. Here, a large expanse of open water almost completely filled in with seagrass between the 1960's survey and 1988. The bare area then expanded almost to the eastern shore between 1988 and 1998 and was little different in the 2002-03 survey. Unlike the dynamic area in the south, much of this area is >1 m m.s.l. in depth.

Measures of seagrass condition are not available in sufficient detail for earlier surveys to make any inferences about possible causes of major shifts in distribution; however, comparisons of measures of condition made in this study between stable areas and areas that have experienced widespread loss or recovery of seagrass may be informative about underlying causes. Perhaps the most widely reported measure of seagrass condition is

maximum depth of occurrence at a location (Duarte, 1991). The absence of seagrass in deep water is a consequence of light limitation—available light at those depths being insufficient to meet the maintenance requirements of the plants. Where conditions are otherwise satisfactory, maximum depth of occurrence is a sensitive indicator of water clarity. The changes in seagrass distribution between 27°20' and 27°25'N in relatively deep water therefore suggest the involvement of changes in water clarity. Although the determination of the outer edge of the seagrass meadow in this area in 1988 was by dead reckoning along two transects and possibly in error by as much as 100 m, it still is possible to estimate the maximum depth of occurrence at that time by determining depth with respect to mean sea level now over the range of possible locations of the 1988 outer edge along the same two transects. According to this reconstruction, the outer edge had moved shoreward 121-333 m along one of the transects and 559-769 m along the other between 1988 and 2006, corresponding to estimated maximum depths of 1.42-1.61 m and 1.69-1.79 m in 1988 and 1.42 m and 1.15-1.41 m in 2006. Although the uncertainty of these reconstructions is large, the outer edge of the meadow has moved shoreward >100 m and maximum depth of occurrence probably has decreased >10 cm. The large uncertainty in maximum depth of occurrence on one of the transects in 2006 has resulted from seagrass being eliminated all the way up to the steep drop-off from a sand overwash fan, such that depth changed 26 cm in the minimum 0.01' longitude (16 m) interval sampled for boundary determination.

The change in water clarity that was responsible for the large reduction in maximum depth of occurrence and area of seagrass coverage between 1988 and the later surveys

was the Texas brown tide, a phytoplankton bloom of unprecedented duration, initiated in June 1990 and continually present through 1997 (Onuf, 2000, 2006; Buskey and others, 2001). An independent, partial confirmation of this analysis is provided by observations made at two light monitors installed in this area in 1991—one at the outer edge of the meadow and one 200 m into the seagrass meadow. Within 1.5 years under the continuing influence of the brown tide, the outer edge of the seagrass meadow receded to the inner monitor (Onuf 1996) and has remained there ever since.

The lack of recovery between the surveys of 1998 and 2002-03, despite abatement of the brown tide in 1997, is cause for concern. Possible reasons for the failure include low available light early in the growing season, a critical time for establishment of newly recruited plants, despite increased light for the year as a whole (Onuf, 2000), and higher turbidity as a consequence of easier resuspension of sediments over lagoon bottom that is no longer protected from wave action by a dense carpet of seagrass blades and roots and rhizomes. Also, although no bloom so long-lasting as the initial Texas brown tide event has occurred since, there has been a succession of shorter blooms, including another brown tide event as recent as December 2005. Data are inadequate to determine whether blooms occur more frequently in the lagoon now rather than in the past; however, for purposes of future management, it is important to be alert to the possibility that changes to the lagoon or its surroundings render it more susceptible to phytoplankton blooms and make the revegetation of deeper areas more difficult. The most obvious candidate is increased nutrient input, although there is no independent evidence to evaluate this possibility.

A latitudinal gradient in maximum depth of occurrence of seagrass is apparent in figure 3. The increase between 27°15' and 27°28'N is probably indicative of increasing water clarity toward the north, away from the mouth of Baffin Bay, where high turbidity is frequent as a result of strong breezes blowing over long fetches and large expanses of bare bottom. In contrast, much more of the bottom is protected from sediment resuspension by a continuous carpet of seagrass, and wind fetch is much reduced over narrower parts of the lagoon toward the north end of Padre Island National Seashore. The shallow edge of seagrass meadow between 0 and 0.5 m m.s.l. across most of the study area is probably set by exposure to air or wave action. The unusually deep shallow edge between 27° 23' and 27° 28' N is in an area of abrupt dropoff from sand overwash fans. The absence of a deep edge in some areas indicate continuous seagrass cover extended to the western boundary of the park.

Changes in water clarity cannot account for all the changes in seagrass cover between surveys in the segment of Padre Island National Seashore between 27°20' and 27°25'N (fig. 2), because a considerable part of the area is shallow enough that available light could not be limiting. The absence in the 1960's survey of seagrass from the shore zone, close to the Intracoastal Waterway, and north of 27°24'N, as well as the whole area south of 27°10'N, is more likely a consequence of the relative isolation of these areas from source populations. According to this interpretation, seagrasses were absent from most of upper Laguna Madre, except close to Corpus Christi Bay before construction of the Gulf Intracoastal Waterway in 1949, because of extreme hypersalinity beyond the tolerance of

all seagrass species. Completion of the waterway through the Land Cut provided a continuous water connection between upper and lower Laguna Madre, affording greater water exchange within the lagoon and with the Gulf of Mexico, resulting in moderation of the salinity regime of the lagoon to within the limits of seagrasses (Quammen and Onuf, 1993). The gradual expansion of seagrass cover through 1988 was the result of colonization of areas where seagrasses previously could not survive (Onuf and others, 2003).

No obvious environmental changes have been observed to account for the large fluctuations of seagrass cover in Nine-Mile Hole between 27°00' and 27°05'N (fig. 2); however, one measure of plant condition, plant height, is maximal in this dynamic area. The 7 highest values of this measure out of a total 77 obtained in this study all were from the Hole (fig. 6, values >6 , ≥ 70 percent of the greatest mean plant height measured in the study). All seven were from locations that had been thickly vegetated in 1988, were bare in 1998, and were again vegetated in 2003 (fig. 16). Apparently, plant height is a sensitive indicator of recovery but not an indicator of impending loss, as would be more valuable in management. Morris and Virnstein (2004) have documented a similar case of dramatic loss and recovery of *Halodule* in a shallow embayment of the northern Indian River Lagoon, Florida, with no clear cause. Perhaps these systems with restricted water exchange are prone to produce too much biomass to be sustained under conditions where much dead material that they themselves produce may accumulate, augmented by drift algae and dead material deposited from elsewhere. The very high pore water ammonium levels found in this same area by Fellows (2004) in another element of this project are

consistent with the luxuriance of the vegetation in the recently colonized sites described here. Decomposition of the vegetation lost between 1988 and 1998 fertilized the substrate that was recolonized between 1998 and 2003.

No other associations between measures of condition and changes in seagrass distribution were found in this study; however, the data collected may serve as a baseline against which to assess future change. Continuity of cover, as indicated by number of samples at a location out of five possible with seagrass present, is high except adjacent to bare areas (fig. 4). This suggests that increased frequency of bare cores within seagrass meadow may be a precursor of bed loss and a diagnostic of adverse change before complete loss occurs. Unfortunately, this measure can only be obtained from a major field sampling program. An alternative may be to identify bed fragmentation in fine-scale aerial photography, as proposed by Pulich (2006).

Mean plant height, shoot density, shoot density*shoot length, live biomass, and dead biomass all tend to have their lowest values at the shallow end of their depth range, highest values at intermediate depths, and intermediate values in deep water (figs. 7, 9, 11, 13, 15), except that shoot densities are both highest and lowest in shallow water (fig. 9). All measures are so variable as to require unfeasibly great effort to detect change over time. Live biomass in this study was somewhat lower than reported for the same general area in 1988 (Onuf, 1996b, fig. 6, upper Laguna, east). However, areas in the vicinity of deep edges of seagrass meadow and extensive areas of very shallow flats that were sampled in 2002-03 were not sampled in 1988, increasing the representation of low

biomass areas in 2002-03 as compared to 1988. This bias cannot be fully analyzed because it was not possible to refer to depths of sample sites to a standard datum in 1988 as it was in 2002-03.

An additional limitation to identifying patterns in this data set is that different parts of the study area were sampled in the autumns of two different years. Live biomass, the one plant characteristic checked for this possibility, was substantially higher in 2002 than 2003, perhaps compromising the validity of some of the spatial patterns described or obscuring a pattern that could have been detected if year and location had not been confounded. Because of the qualifications inherent in other parameters, sensitivity of plant height to recent recolonization and possible changes in continuity of cover appear to be the most promising indicators of condition considered in this study.

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Table 1. Regression analyses of biomass on A. mean shoot length (cm), B. mean shoot density (mean number * m⁻²), C. mean shoot length * mean shoot density.

A. biomass = 9.6024 * mean shoot length + 3.3792, df = 38, $r^2 = 0.3846$

B. biomass = 0.0288 * mean shoot density + 41.946, df = 38, $r^2 = 0.3316$

C. biomass = 0.8596 * mean shoot length * mean shoot density + 30.285, df = 38,
 $r^2 = 0.5891$

Figure Legends

Figure 1. Map of the study area of Laguna Madre within the boundaries of Padre Island National Seashore, showing the sampling grid for measures of seagrass condition.

Figure 2. Maps of seagrass cover within the boundaries of Padre Island National Seashore in the mid-1960s (left), mid-1970s (middle left), 1988 (middle), 1998 (middle right), and 2002-03 (right).

Figure 3. Minimum and maximum depth of seagrass occurrence along different transects.

Figure 4. Continuity of cover as indicated by frequency of occurrence in five samples collected at each station in the 1' latitude by 0.25' longitude sampling grid (see fig. 1).

Figure 5. Frequency of seagrass occurrence in different depth classes.

Figure 6. Mean plant height determined from four samples collected at each station in the 1' latitude by 0.25' longitude sampling grid (see fig. 1) expressed as 10 percentile classes of highest mean plant height found in the study.

Figure 7. Mean plant height in relation to depth.

Figure 8. Mean shoot density determined from four cores collected at each station in the 1' latitude by 0.25' longitude sampling grid (see fig. 1) expressed as 10 percentile classes of highest mean shoot density found in the study.

Figure 9. Mean shoot density in relation to depth.

Figure 10. Mean plant height * mean shoot density determined from four samples collected at each station in the 1' latitude by 0.25' longitude sampling grid (see fig. 1) expressed as 10 percentile classes of highest mean plant height * mean shoot density found in the study.

Figure 11. Mean plant height * mean shoot density in relation to depth.

Figure 12. Mean live biomass determined from four samples collected at each station in the 1' latitude by 0.5' longitude sampling grid (see fig. 1) expressed as 10 percentile classes of highest mean live biomass found in the study.

Figure 13. Mean live biomass in relation to depth.

Figure 14. Mean dead biomass determined from four samples collected at each station in the 1' latitude by 0.5' longitude sampling grid (see fig. 1) expressed as 10 percentile classes of highest mean dead biomass found in the study.

Figure 15. Mean dead biomass in relation to depth.

Figure 16. Changes of seagrass cover in Nine Mile-Hole in relation to the seven stations with tallest seagrass found in the study.

wl@bi
in2005

MIN N MIN W
27 DEG 97 DEG

YYMMDD TIME LAT LON arclon arclat DEP WLMSL DEPMSL SAL SEC

PADRE ISLAND NATIONAL SEASHORE SEAGRASS SURVEY 2002-2006

Key to abbreviations

Column headings -

YYMMDD Date (year,month,day)
TIME Estimated time samples taken
LAT Minutes of latitude north of 27 degrees N North American Datum 1983. Use 34 meter south correction on USGS quads.
LON Minutes of longitude west of 97 degrees W North American Datum 1983. Use 27 meter east correction on USGS quads.
arclon Longitude in decimal degrees for export to ArcView
arclat Latitude in decimal degrees for export to ArcView
DEP Depth (cm), suffixes S=stern, B=bow, Anc=anchor
WLMSL Water level with respect to mean sea level at Bird Island at sample time
DEPMSL Depth with respect to mean sea level at sample time (DEP - WLMSL)
SAL Salinity (ppt)
SEC Secchi depth (cm)
DOM Dominant cover type in each of 4 cores
SUB Subordinate cover types in each of 4 cores
ANCHOR Cover types pulled up on anchor in decreasing order of estimated biomass contributed
EDGE Edge of meadow or boundary between zones dominated by different species. Species at next boundary on transect defines what is on other side of boundary, unless it is an inner or outer edge. Suffix modifies edge - i=inner, o=outer n=north, e=east, s=south, w=west.
SorD Seagrass meadow edge identified as shallow (S) or deep (D)
DENSITY Shoot density in each of 4 cores collected at a station on the predetermined 1' lat by 0.25' lon sampling grid
PLANT HT(CM) Plant height as determined from longest shoots in each of 4 posthole digger samples

Cell entries - columns L to O. Notes usually in S.

B Bare
broad,flat broad or flat alga, Dictyota dichotoma
C Acetabularia crenulata
calc-alg calcareous alga
filgn,filgreen filamentous green alga
G Gracilaria
giww Gulf Intracoastal Waterway
hairy hairy red or red-brown, Digenia simplex
He Halophila engelmanni
Hw Halodule wrightii
J Jania capillacea
L Laurencia poitei
pink pink alga
Rm Ruppia maritima
Sf Syringodium filiforme
smoothred,smooth,smred smooth red alga

Tt	Thalassia testudinum
TV	terrestrial vegetation (usually succulents such as Salicornia)
WL	waterline

21030	1407	31.998	17.56	-97.29	27.533	178	0.458	1.322	
21030	1413.4	32	17.502	-97.29	27.533	155	0.458	1.092	
21030	1426.2	32	17.47	-97.29	27.533	56	0.458	0.102	
21030	1419.8	32	17.46	-97.29	27.533		0.458	-0.458	
21030	1432.5	32	17.331	-97.29	27.533		0.458	-0.458	
21030	1438.9	32	17.321	-97.29	27.533	50	0.458	0.042	
21030	1458.1	32	17.311	-97.29	27.533	58	0.458	0.122	
21030	1504	32	17.282	-97.29	27.533	84	0.435	0.405	
21030	1451.7	32.003	17.263	-97.29	27.533	125	0.458	0.792	
21030	1445.3	32	17.251	-97.29	27.533	135	0.458	0.892	26
21030	1516.8	32.005	17.239	-97.29	27.533	144	0.435	1.005	
21030	1523.2	32.002	17.221	-97.29	27.533	141	0.435	0.975	
21030	1510.4	32.001	17.213	-97.29	27.533	134	0.435	0.905	
21030	1530	32.003	17.001	-97.28	27.533	62	0.435	0.185	
21030	1530	32.003	17.001	-97.28	27.533	62	0.435	0.185	
21030	1530	32.003	17.001	-97.28	27.533	62	0.435	0.185	
21030	1530	32.003	17.001	-97.28	27.533	62	0.435	0.185	
21106	1400	32.002	16.753	-97.28	27.533	95	0.515	0.435	15
21106	1428.8	32.005	16.742	-97.28	27.533	86	0.515	0.345	
21106	1423	32.006	16.734	-97.28	27.533	73	0.515	0.215	
21106	1417.3	32.001	16.712	-97.28	27.533	64	0.515	0.125	
21106	1405.8	32.004	16.497	-97.27	27.533	42	0.515	-0.095	
21106	1411.5	32.002	16.247	-97.27	27.533	20	0.515	-0.315	
21202	1430	30.998	18.091	-97.3	27.517	200	0.033	1.967	
21202	1435	31.003	18.073	-97.3	27.517	72	0.033	0.687	
21202	1455	31	18.01	-97.3	27.517	25	0.033	0.217	
21202	1440	31	18	-97.3	27.517	9	0.033	0.057	
21202	1445	31	17.999	-97.3	27.517	0	0.033	-0.033	
21202	1450	31	17.994	-97.3	27.517		0.033	-0.033	
21106	1434.5	31	17.878	-97.3	27.517		0.515	-0.515	
21106	1440.3	30.998	17.869	-97.3	27.517	71	0.515	0.195	20
21106	1446	31	17.86	-97.3	27.517	81	0.515	0.295	
21106	1451.8	31.003	17.849	-97.3	27.517	72	0.515	0.205	
21106	1457.5	31.001	17.84	-97.3	27.517	71	0.515	0.195	
21106	1508.8	31.003	17.831	-97.3	27.517	44	0.51	-0.07	
21106	1503	30.998	17.821	-97.3	27.517	69	0.51	0.18	
21106	1514.5	31	17.812	-97.3	27.517	54	0.51	0.03	
21106	1520.3	31.001	17.8	-97.3	27.517	67	0.51	0.16	
21106	1526	31.001	17.789	-97.3	27.517	72	0.51	0.21	
21106	1532	31.001	17.748	-97.3	27.517	114	0.51	0.63	18
21106	1532	31.001	17.748	-97.3	27.517	114	0.51	0.63	
21106	1532	31.001	17.748	-97.3	27.517	114	0.51	0.63	
21106	1532	31.001	17.748	-97.3	27.517	114	0.51	0.63	
21107	1340	31.003	17.5	-97.29	27.517	86	0.453	0.407	
21107	1340	31.003	17.5	-97.29	27.517	86	0.453	0.407	18
21107	1340	31.003	17.5	-97.29	27.517	86	0.453	0.407	
21107	1340	31.003	17.5	-97.29	27.517	86	0.453	0.407	
21107	1400	31.001	17.251	-97.29	27.517	113	0.452	0.678	
21107	1400	31.001	17.251	-97.29	27.517	113	0.452	0.678	
21107	1400	31.001	17.251	-97.29	27.517	113	0.452	0.678	
21107	1400	31.001	17.251	-97.29	27.517	113	0.452	0.678	17
21107	1427.3	31.001	17.132	-97.29	27.517	118	0.452	0.728	
21107	1430.9	31.004	17.12	-97.29	27.517	89	0.452	0.438	
21107	1434.5	31.001	17.109	-97.29	27.517	89	0.452	0.438	

21107	1438.2	30.998	17.099	-97.28	27.517	80	0.452	0.348	
21107	1423.6	31.005	17.091	-97.28	27.517	89	0.452	0.438	
21107	1420	31.006	17.048	-97.28	27.517	0	0.452	-0.452	
21202	1500	30	18.617	-97.31	27.5	200	0.013	1.987	
21202	1505	30	18.61	-97.31	27.5	67	0.013	0.657	
21202	1510	30.003	18.501	-97.31	27.5	78	0.013	0.767	
21202	1510	30.003	18.501	-97.31	27.5	78	0.013	0.767	
21202	1510	30.003	18.501	-97.31	27.5	78	0.013	0.767	
21202	1510	30.003	18.501	-97.31	27.5	78	0.013	0.767	
21107	1540	30.004	18.256	-97.3	27.5	105	0.444	0.606	
21107	1540	30.004	18.256	-97.3	27.5	105	0.444	0.606	
21107	1540	30.004	18.256	-97.3	27.5	105	0.444	0.606	
21107	1540	30.004	18.256	-97.3	27.5	105	0.444	0.606	
21107	1520	30.002	18.003	-97.3	27.5	112	0.444	0.676	
21107	1520	30.002	18.003	-97.3	27.5	112	0.444	0.676	
21107	1520	30.002	18.003	-97.3	27.5	112	0.444	0.676	
21107	1520	30.002	18.003	-97.3	27.5	112	0.444	0.676	
21107	1500	30.005	17.751	-97.3	27.5	108	0.444	0.636	
21107	1500	30.005	17.751	-97.3	27.5	108	0.444	0.636	
21107	1500	30.005	17.751	-97.3	27.5	108	0.444	0.636	
21107	1500	30.005	17.751	-97.3	27.5	108	0.444	0.636	
21107	1449.1	30.001	17.712	-97.3	27.5	110	0.452	0.648	
21107	1452.7	30.003	17.69	-97.29	27.5	111	0.452	0.658	
21107	1456.4	30.002	17.682	-97.29	27.5	109	0.452	0.638	
21107	1445.5	30.006	17.671	-97.29	27.5	103	0.452	0.578	
21107	1441.8	30.004	17.632	-97.29	27.5	30	0.452	-0.152	
21202	1530	29.001	19.137	-97.32	27.483	200	0.013	1.987	
21202	1535	29.003	19.12	-97.32	27.483	88	0.013	0.867	
21202	1550	29.001	19.035	-97.32	27.483	39	0.013	0.377	
21202	1540	29	19.025	-97.32	27.483	0	0.013	-0.013	
21202	1545	29	19.023	-97.32	27.483		0.013	-0.013	
21202	1218.1	29	18.859	-97.31	27.483		0.036	-0.036	
21202	1214	29	18.857	-97.31	27.483	0	0.036	-0.036	
21202	1222.1	29	18.847	-97.31	27.483	26	0.036	0.224	20
21202	1154	29.003	18.754	-97.31	27.483	81	0.04	0.77	
21202	1154	29.003	18.754	-97.31	27.483	81	0.04	0.77	
21202	1154	29.003	18.754	-97.31	27.483	81	0.04	0.77	
21202	1154	29.003	18.754	-97.31	27.483	81	0.04	0.77	
21202	1134	29.003	18.505	-97.31	27.483	90	0.04	0.86	
21202	1134	29.003	18.505	-97.31	27.483	90	0.04	0.86	
21202	1134	29.003	18.505	-97.31	27.483	90	0.04	0.86	
21202	1133.5	29.003	18.505	-97.31	27.483	90	0.04	0.86	
21202	1125.4	29.003	18.323	-97.31	27.483	102	0.04	0.98	
21202	1129.4	29	18.312	-97.31	27.483	60	0.04	0.56	
21202	1226.2	29.002	18.301	-97.31	27.483		0.036	-0.036	20
21202	1121.3	29	18.273	-97.3	27.483	23	0.04	0.19	
21202	1117.3	29	18.263	-97.3	27.483	37	0.04	0.33	
21202	1113.2	29	18.253	-97.3	27.483	25	0.04	0.21	
21202	1109.1	29	18.243	-97.3	27.483	36	0.04	0.32	
21202	1105.1	29	18.233	-97.3	27.483	30	0.04	0.26	
21202	1101	29	18.223	-97.3	27.483	30	0.04	0.26	
21202	1057.2	29	18.213	-97.3	27.483	27	0.04	0.23	
21202	1053.1	29	18.203	-97.3	27.483	23	0.04	0.19	
21202	1045	29	18.193	-97.3	27.483	0	0.04	-0.04	
21202	1049.1	29	18.19	-97.3	27.483		0.04	-0.04	
21202	1555	28.004	19.655	-97.33	27.467	181	0.013	1.797	
21202	1600	28.003	19.644	-97.33	27.467	164	0.028	1.612	
21203	1212	28.005	19.629	-97.33	27.467	169	0.057	1.633	

21203	1240	28.003	19.622	-97.33	27.467	170	0.057	1.643
21203	1236	28.006	19.611	-97.33	27.467	170	0.057	1.643
21203	1232	28.003	19.601	-97.33	27.467	171	0.057	1.653
21203	1216	27.999	19.59	-97.33	27.467	172	0.057	1.663
21203	1228	28.004	19.58	-97.33	27.467	172	0.057	1.663
21203	1224	28.003	19.571	-97.33	27.467	171	0.057	1.653
21203	1220	28.001	19.549	-97.33	27.467	169	0.057	1.633
21203	1152	28.004	19.502	-97.33	27.467	160	0.058	1.542
21203	1152	28.004	19.502	-97.33	27.467	160	0.058	1.542
21203	1152	28.004	19.502	-97.33	27.467	160	0.058	1.542
21203	1152	28.004	19.502	-97.33	27.467	160	0.058	1.542
21203	1132	28.005	19.253	-97.32	27.467	134	0.058	1.282
21203	1132	28.005	19.253	-97.32	27.467	134	0.058	1.282
21203	1132	28.005	19.253	-97.32	27.467	134	0.058	1.282
21203	1132	28.005	19.253	-97.32	27.467	134	0.058	1.282
21203	1112	28.003	19.001	-97.32	27.467	120	0.058	1.142
21203	1112	28.003	19.001	-97.32	27.467	120	0.058	1.142
21203	1112	28.003	19.001	-97.32	27.467	120	0.058	1.142
21203	1112	28.003	19.001	-97.32	27.467	120	0.058	1.142
21203	1104	28.004	18.908	-97.32	27.467	114	0.058	1.082
21203	1108	28.002	18.898	-97.31	27.467	84	0.058	0.782
21203	1040	28	18.883	-97.31	27.467	34	0.062	0.278
21203	1044	28	18.873	-97.31	27.467	31	0.062	0.248
21203	1048	28	18.863	-97.31	27.467	21	0.062	0.148
21203	1052	28	18.853	-97.31	27.467	21	0.062	0.148
21203	1056	28	18.844	-97.31	27.467	0	0.062	-0.062
21203	1100	28	18.83	-97.31	27.467		0.058	-0.058
50804	1537.3	27.747	19.792	-97.33	27.462	168	0.577	1.698
50804	1542.7	27.748	19.781	-97.33	27.462	138	0.577	1.398
50804	1553.6	27.753	19.77	-97.33	27.463	147	0.577	1.488
50804	1548.2	27.75	19.758	-97.33	27.463	163	0.577	1.648
50804	1559.1	27.749	19.722	-97.33	27.462	164	0.577	1.658
50804	1609.5	27.753	19.712	-97.33	27.463	164	0.573	1.662
50804	1604	27.751	19.7	-97.33	27.463	142	0.573	1.442
50727	1521.8	27.498	19.92	-97.33	27.458	142	0.664	1.351
50727	1527.3	27.497	19.911	-97.33	27.458	141	0.664	1.341
50727	1532.7	27.498	19.9	-97.33	27.458	158	0.664	1.511
50727	1538.2	27.5	19.861	-97.33	27.458	180	0.664	1.731
50727	1549.1	27.502	19.84	-97.33	27.458	179	0.664	1.721
50727	1554.5	27.504	19.831	-97.33	27.458	174	0.664	1.671
50727	1543.6	27.501	19.818	-97.33	27.458	160	0.664	1.531
50727	1516.4	27.248	20.039	-97.33	27.454	159	0.664	1.521
50727	1510.9	27.248	20.049	-97.33	27.454	190	0.664	1.831
50804	1515.5	27.254	20.021	-97.33	27.454	154	0.577	1.558
50804	1520.9	27.251	20.012	-97.33	27.454	163	0.577	1.648
50804	1510	27.247	20.003	-97.33	27.454	167	0.577	1.688
50727	1600	27.248	19.991	-97.33	27.454	176	0.66	1.695
50804	1526.4	27.253	19.911	-97.33	27.454	152	0.577	1.538
50804	1531.8	27.254	19.903	-97.33	27.454	107	0.577	1.088
21217	1600	27.008	20.18	-97.34	27.45	190	-0.05	1.95
31125	1118	27.006	20.16	-97.34	27.45	124	0.058	1.182
31125	1126	27.007	20.151	-97.34	27.45	174	0.058	1.682
31125	1134	27.001	20.109	-97.34	27.45	180	0.058	1.742
31125	1150	27.005	20.091	-97.33	27.45	181	0.058	1.752
31125	1158	27.001	20.08	-97.33	27.45	181	0.058	1.752
31125	1142	27	20.071	-97.33	27.45	178	0.058	1.722
31125	1110	27.005	20.004	-97.33	27.45	124	0.058	1.182
21217	1115.2	27.003	20.004	-97.33	27.45	114	-0.05	1.19

21217	1120.4	27.003	20.004	-97.33	27.45	114	-0.05	1.19	
21217	1125.7	27.003	20.004	-97.33	27.45	114	-0.05	1.19	
21217	1130.9	27.003	20.004	-97.33	27.45	114	-0.05	1.19	
31125	1110	27.005	20.004	-97.33	27.45	124	0.058	1.182	
31125	1110	27.005	20.004	-97.33	27.45	124	0.058	1.182	
50715	1100	27.002	19.878	-97.33	27.45	164	0.693	1.542	
31125	1102	27.001	19.754	-97.33	27.45	156	0.058	1.502	
31125	1102	27.001	19.754	-97.33	27.45	156	0.058	1.502	
31125	1102	27.001	19.754	-97.33	27.45	156	0.058	1.502	
31125	1102	27.001	19.754	-97.33	27.45	156	0.058	1.502	
21217	1107.2	27.001	19.749	-97.33	27.45	140	-0.05	1.45	
21217	1112.4	27.001	19.749	-97.33	27.45	140	-0.05	1.45	
21217	1117.7	27.001	19.749	-97.33	27.45	140	-0.05	1.45	
21217	1122.9	27.001	19.749	-97.33	27.45	140	-0.05	1.45	
31125	1054	27.003	19.505	-97.33	27.45	142	0.071	1.349	
31125	1054	27.003	19.505	-97.33	27.45	142	0.071	1.349	
31125	1054	27.003	19.505	-97.33	27.45	142	0.071	1.349	
31125	1054	27.003	19.505	-97.33	27.45	142	0.071	1.349	
21217	1059.2	27.001	19.501	-97.33	27.45	135	-0.05	1.4	
21217	1503	27.001	19.501	-97.33	27.45	135	-0.05	1.4	
21217	1508.2	27.001	19.501	-97.33	27.45	135	-0.05	1.4	
21217	1513.4	27.001	19.501	-97.33	27.45	135	-0.05	1.4	
21217	1518.7	27.005	19.482	-97.32	27.45	135	-0.05	1.4	
21217	1523.9	27.004	19.473	-97.32	27.45	73	-0.05	0.78	
21217	1529.1	27.002	19.463	-97.32	27.45	50	-0.05	0.55	
31125	1038	27.005	19.452	-97.32	27.45	158	0.071	1.509	
21217	1043.2	27	19.449	-97.32	27.45	46	-0.05	0.51	25
31125	1046	27.002	19.442	-97.32	27.45	72	0.071	0.649	
21217	1051.2	27	19.439	-97.32	27.45	43	-0.05	0.48	
21217	1056.4	27	19.429	-97.32	27.45	48	-0.05	0.53	
31125	1030	26.998	19.427	-97.32	27.45	66	0.071	0.589	37
21217	1035.2	27	19.419	-97.32	27.45	23	-0.05	0.28	
21217	1040.4	27	19.409	-97.32	27.45	25	-0.05	0.3	
21217	1045.7	27	19.399	-97.32	27.45	14	-0.05	0.19	19
21217	1400	27	19.389	-97.32	27.45	0	-0.05	0.05	
21217	1405.2	27	19.376	-97.32	27.45		-0.05	0.05	
50715	1110	26.961	19.904	-97.33	27.449	173	0.693	1.632	
50715	1120	26.922	19.923	-97.33	27.449	170	0.693	1.602	
50727	1505.5	26.913	19.91	-97.33	27.449	173	0.664	1.661	
50727	1500	26.893	19.928	-97.33	27.448	173	0.664	1.661	
50629	1546	26.753	19.933	-97.33	27.446	185	0.764	1.681	
50629	1560.7	26.753	19.922	-97.33	27.446	182	0.764	1.651	
50629	1555.8	26.754	19.913	-97.33	27.446	181	0.764	1.641	
50629	1550.9	26.751	19.892	-97.33	27.446	172	0.764	1.551	
50629	1531.3	26.502	20.002	-97.33	27.442	182	0.764	1.651	
50629	1541.1	26.501	19.99	-97.33	27.442	183	0.764	1.661	
50629	1536.2	26.503	19.983	-97.33	27.442	181	0.764	1.641	
50629	1526.4	26.503	19.962	-97.33	27.442	175	0.764	1.581	
50629	1521.6	26.252	20.063	-97.33	27.438	183	0.764	1.661	
50629	1516.7	26.254	20.051	-97.33	27.438	183	0.764	1.661	
50629	1511.8	26.253	20.014	-97.33	27.438	176	0.764	1.591	
31125	1214	26.006	20.682	-97.34	27.433	230	0.055	2.245	
31125	1206	26.001	20.671	-97.34	27.433	119	0.055	1.135	
31125	1222	26	20.513	-97.34	27.433	20	0.055	0.145	
31125	1230	26	20.511	-97.34	27.433	0	0.055	-0.055	
31125	1238	26	20.509	-97.34	27.433		0.055	-0.055	
31125	1246	26	20.49	-97.34	27.433		0.055	-0.055	
31125	1254	26	20.487	-97.34	27.433	0	0.055	-0.055	

31125	1302	26	20.482	-97.34	27.433	40	0.046	0.354
31125	1318	26.006	20.322	-97.34	27.433	134	0.046	1.294
31125	1326	26.005	20.279	-97.34	27.433	121	0.046	1.164
31125	1342	26.004	20.271	-97.34	27.433	161	0.046	1.564
31125	1334	26	20.26	-97.34	27.433	176	0.046	1.714
31125	1310	26.001	20.249	-97.34	27.433	176	0.046	1.714
31125	1510	26.004	20.103	-97.34	27.433	169	0.045	1.645
31125	1438	26.007	20.09	-97.33	27.433	170	0.044	1.656
31125	1502	26.001	20.081	-97.33	27.433	169	0.045	1.645
31125	1454	26.003	20.072	-97.33	27.433	168	0.044	1.636
31125	1446	26.001	20.051	-97.33	27.433	160	0.044	1.556
31125	1350	26.002	19.998	-97.33	27.433	158	0.046	1.534
31125	1350	26.002	19.998	-97.33	27.433	158	0.046	1.534
31125	1350	26.002	19.998	-97.33	27.433	158	0.046	1.534
31125	1350	26.002	19.998	-97.33	27.433	158	0.046	1.534
31125	1422	26.003	19.923	-97.33	27.433	156	0.044	1.516
31125	1430	26.003	19.911	-97.33	27.433	152	0.044	1.476
31125	1414	26.004	19.901	-97.33	27.433	152	0.044	1.476
31125	1406	26.003	19.89	-97.33	27.433	139	0.044	1.346
31125	1358	26	19.879	-97.33	27.433	34	0.046	0.294
50216	1230	25.668	20.701	-97.35	27.428	36	0.675	0.28
50216	1220	25.592	20.783	-97.35	27.427	44	0.675	0.36
31230	1103	25.005	21.2	-97.35	27.417	113	-0.006	1.136
31230	1041.7	25.005	21.007	-97.35	27.417	132	-0.004	1.324
31230	1057.4	25.005	21.007	-97.35	27.417	132	-0.004	1.324
31230	1052.2	25.005	21.007	-97.35	27.417	132	-0.004	1.324
31230	1047	25.005	21.007	-97.35	27.417	132	-0.004	1.324
31230	1036.5	25.004	20.753	-97.35	27.417	135	-0.004	1.354
31230	1031.3	25.004	20.753	-97.35	27.417	135	-0.004	1.354
31230	1020.9	25.004	20.753	-97.35	27.417	135	-0.004	1.354
31230	1026.1	25.004	20.753	-97.35	27.417	135	-0.004	1.354
31230	1010.4	25.003	20.504	-97.34	27.417	125	-0.004	1.254
31230	1005.2	25.003	20.504	-97.34	27.417	125	-0.004	1.254
31230	1015.7	25.003	20.504	-97.34	27.417	125	-0.004	1.254
31230	1000	25.003	20.504	-97.34	27.417	125	-0.004	1.254
31229	1045	25.003	20.251	-97.34	27.417	130	0.083	1.217
31229	1045	25.003	20.251	-97.34	27.417	130	0.083	1.217
31229	1045	25.003	20.251	-97.34	27.417	130	0.083	1.217
31229	1045	25.003	20.251	-97.34	27.417	130	0.083	1.217
31229	1030	25.006	20.004	-97.33	27.417	114	0.083	1.057
31229	1030	25.006	20.004	-97.33	27.417	114	0.083	1.057
31229	1030	25.006	20.004	-97.33	27.417	114	0.083	1.057
31229	1030	25.006	20.004	-97.33	27.417	114	0.083	1.057
31229	1020	25.002	19.883	-97.33	27.417	104	0.083	0.957
31229	1015	24.997	19.871	-97.33	27.417	109	0.083	1.007
31203	1050	25.005	19.856	-97.33	27.417	32	0.05	0.27
50301	1000	24.294	21.369	-97.36	27.405	38	0.786	0.189
50301	1004.9	24.206	21.431	-97.36	27.403	47	0.786	0.279
50301	1009.8	24.173	21.453	-97.36	27.403	45	0.786	0.259
50301	1019.6	24.004	21.753	-97.36	27.4	>200	0.786	-0.191
50301	1014.7	24.004	21.74	-97.36	27.4	133	0.786	1.139
31230	1108.2	24	21.729	-97.36	27.4	158	-0.006	1.586
31230	1113.4	24.005	21.72	-97.36	27.4	106	-0.006	1.066
50301	1024.5	24.003	21.574	-97.36	27.4	59	0.786	0.399
31230	1129.1	23.996	21.505	-97.36	27.4	44	-0.006	0.446
31230	1118.7	23.996	21.505	-97.36	27.4	44	-0.006	0.446
31230	1134.3	23.996	21.505	-97.36	27.4	44	-0.006	0.446
31230	1123.9	23.996	21.505	-97.36	27.4	44	-0.006	0.446

31230	1144.7	24.001	21.252	-97.35	27.4	145	-0.006	1.456
31230	1139.5	24.001	21.252	-97.35	27.4	145	-0.006	1.456
31230	1150	24.001	21.252	-97.35	27.4	145	-0.006	1.456
31230	1155.2	24.001	21.252	-97.35	27.4	145	-0.006	1.456
31230	1200	24.003	21.001	-97.35	27.4	137	-0.01	1.38
31230	1210.4	24.003	21.001	-97.35	27.4	137	-0.01	1.38
31230	1215.7	24.003	21.001	-97.35	27.4	137	-0.01	1.38
31230	1205.2	24.003	21.001	-97.35	27.4	137	-0.01	1.38
31230	1226.1	23.999	20.755	-97.35	27.4	131	-0.01	1.32
31230	1231.3	23.999	20.755	-97.35	27.4	131	-0.01	1.32
31230	1220.9	23.999	20.755	-97.35	27.4	131	-0.01	1.32
31230	1236.5	23.999	20.755	-97.35	27.4	131	-0.01	1.32
31230	1257.4	24.004	20.501	-97.34	27.4	124	-0.01	1.25
31230	1241.7	24.004	20.501	-97.34	27.4	124	-0.01	1.25
31230	1252.2	24.004	20.501	-97.34	27.4	124	-0.01	1.25
31230	1247	24.004	20.501	-97.34	27.4	124	-0.01	1.25
31230	1303	23.996	20.383	-97.34	27.4	122	-0.012	1.232
31230	1308.2	23.998	20.373	-97.34	27.4	52	-0.012	0.532
50629	1229.8	23.943	21.225	-97.35	27.399	160	0.771	1.424
50629	1239.6	23.921	21.23	-97.35	27.399	162	0.771	1.444
50629	1244.4	23.908	21.237	-97.35	27.398	167	0.771	1.494
50629	1249.3	23.906	21.043	-97.35	27.398	159	0.771	1.414
50629	1234.7	23.897	21.239	-97.35	27.398	165	0.771	1.474
50629	1224.9	23.864	21.261	-97.35	27.398	169	0.771	1.514
50629	1254.2	23.829	21.085	-97.35	27.397	164	0.771	1.464
50629	1323.6	23.763	20.898	-97.35	27.396	167	0.767	1.498
50629	1220	23.754	21.333	-97.36	27.396	172	0.771	1.544
50629	1259.1	23.747	21.121	-97.35	27.396	171	0.771	1.534
50629	1333.3	23.752	20.907	-97.35	27.396	169	0.767	1.518
50629	1328.4	23.738	20.913	-97.35	27.396	170	0.767	1.528
50629	1308.9	23.732	21.127	-97.35	27.396	166	0.767	1.488
50629	1318.7	23.72	20.921	-97.35	27.395	170	0.767	1.528
50629	1313.8	23.719	21.134	-97.35	27.395	166	0.767	1.488
50629	1304	23.707	21.144	-97.35	27.395	170	0.767	1.528
50629	1506.9	23.502	20.852	-97.35	27.392	188	0.764	1.711
50629	1338.2	23.501	20.839	-97.35	27.392	78	0.767	0.608
50629	1343.1	23.5	20.83	-97.35	27.392	62	0.767	0.448
50629	1348	23.5	20.82	-97.35	27.392	67	0.767	0.498
50629	1352.9	23.5	20.81	-97.35	27.392	65	0.767	0.478
50629	1357.8	23.5	20.8	-97.35	27.392	65	0.767	0.478
50629	1403	23.5	20.79	-97.35	27.392	62	0.765	0.45
50629	1407.9	23.5	20.78	-97.35	27.392	55	0.765	0.38
50629	1412.8	23.5	20.77	-97.35	27.392	61	0.765	0.44
50629	1417.7	23.5	20.76	-97.35	27.392	48	0.765	0.31
50629	1422.6	23.5	20.75	-97.35	27.392	48	0.765	0.31
50629	1427.4	23.5	20.74	-97.35	27.392	49	0.765	0.32
50629	1432.3	23.5	20.73	-97.35	27.392	39	0.765	0.22
50629	1437.2	23.5	20.72	-97.35	27.392	43	0.765	0.26
50629	1442.1	23.5	20.71	-97.35	27.392	39	0.765	0.22
50629	1447	23.5	20.7	-97.35	27.392	34	0.765	0.17
50629	1451.9	23.5	20.69	-97.34	27.392	24	0.765	0.07
50629	1456.8	23.5	20.68	-97.34	27.392	22	0.765	0.05
50629	1502	23.5	20.67	-97.34	27.392	0	0.764	-0.169
50301	1049.1	23.42	21.88	-97.36	27.39	38	0.786	0.189
50301	1044.2	23.42	21.87	-97.36	27.39	31	0.786	0.119
50301	1039.3	23.42	21.86	-97.36	27.39	29	0.786	0.099
50301	1034.4	23.421	21.851	-97.36	27.39	10	0.786	-0.091
50301	1029.5	23.42	21.841	-97.36	27.39	27	0.786	0.079

50301	1054	23.42	21.831	-97.36	27.39	40	0.786	0.209
50301	1058.9	23.381	21.913	-97.37	27.39	45	0.786	0.259
31230	1447	23	22.243	-97.37	27.383	170	-0.012	1.712
31230	1452.2	23.006	22.232	-97.37	27.383	104	-0.012	1.052
31230	1457.4	23.004	22.221	-97.37	27.383	107	-0.012	1.082
31230	1505.2	23.005	22.194	-97.37	27.383	117	-0.017	1.187
31230	1500	23	22.181	-97.37	27.383	116	-0.017	1.177
31230	1441.7	23.004	22.024	-97.37	27.383	56	-0.012	0.572
31230	1436.5	23.007	22.013	-97.37	27.383	70	-0.012	0.712
31230	1355.2	23.002	22.006	-97.37	27.383	69	-0.012	0.702
31230	1431.3	23.006	21.994	-97.37	27.383	71	-0.012	0.722
31230	1426.1	23.001	21.982	-97.37	27.383	65	-0.012	0.662
31230	1400	22.999	21.961	-97.37	27.383	75	-0.012	0.762
31230	1410.4	23.002	21.924	-97.37	27.383	80	-0.012	0.812
31230	1415.7	22.999	21.903	-97.37	27.383	147	-0.012	1.482
31230	1420.9	23	21.892	-97.36	27.383	159	-0.012	1.602
31230	1405.2	23	21.882	-97.36	27.383	158	-0.012	1.592
31230	1350	23.005	21.758	-97.36	27.383	168	-0.012	1.692
31230	1344.7	23.003	21.505	-97.36	27.383	174	-0.012	1.752
31230	1334.3	23.001	21.252	-97.35	27.383	164	-0.012	1.652
31230	1339.5	23.004	21.127	-97.35	27.383	162	-0.012	1.632
31230	1329.1	23.005	21.006	-97.35	27.383	149	-0.012	1.502
31230	1323.9	23.006	20.963	-97.35	27.383	134	-0.012	1.352
31230	1318.7	23.003	20.951	-97.35	27.383	122	-0.012	1.232
31230	1313.4	23.003	20.943	-97.35	27.383	24	-0.012	0.252
50216	1210	22.75	22.19	-97.37	27.379	34	0.675	0.26
50216	1200	22.701	22.23	-97.37	27.378	33	0.675	0.25
50310	1414.2	20.661	22.871	-97.38	27.344	164	0.692	1.543
31230	1510.4	22	22.679	-97.38	27.367	158	-0.017	1.597
31230	1515.7	22.001	22.498	-97.37	27.367	170	-0.017	1.717
31230	1520.9	22.001	22.247	-97.37	27.367	176	-0.017	1.777
31230	1526.1	21.996	22.005	-97.37	27.367	163	-0.017	1.647
31230	1536.5	22.007	21.83	-97.36	27.367	154	-0.017	1.557
31230	1547	22.001	21.812	-97.36	27.367	154	-0.017	1.557
31230	1552.2	22.005	21.801	-97.36	27.367	157	-0.017	1.587
31230	1541.7	22.001	21.79	-97.36	27.367	149	-0.017	1.507
31230	1531.3	22.001	21.751	-97.36	27.367	109	-0.017	1.107
31230	1600	21.997	21.659	-97.36	27.367	84	-0.033	0.873
31230	1557.4	21.993	21.648	-97.36	27.367	35	-0.017	0.367
50301	1138.4	21.752	21.993	-97.37	27.363	161	0.782	1.423
50301	1128.5	21.752	21.95	-97.37	27.363	166	0.782	1.473
50301	1143.3	21.751	21.921	-97.37	27.363	160	0.782	1.413
50301	1133.5	21.748	21.91	-97.37	27.362	159	0.782	1.403
50301	1104	21.75	21.805	-97.36	27.363	35	0.782	0.163
50301	1108.9	21.75	21.795	-97.36	27.363	37	0.782	0.183
50301	1113.8	21.75	21.785	-97.36	27.363	43	0.782	0.243
50301	1118.7	21.75	21.775	-97.36	27.363	49	0.782	0.303
50301	1123.6	21.75	21.756	-97.36	27.363		0.782	-0.187
50301	1207.9	21.504	21.871	-97.36	27.358	144	0.777	1.258
50301	1212.8	21.498	21.831	-97.36	27.358	140	0.777	1.218
50301	1217.7	21.499	21.81	-97.36	27.358	136	0.777	1.178
50301	1222.6	21.5	21.801	-97.36	27.358	131	0.777	1.128
50301	1203	21.5	21.787	-97.36	27.358	57	0.777	0.388
50301	1158	21.5	21.784	-97.36	27.358	47	0.782	0.283
50301	1153.1	21.5	21.774	-97.36	27.358	35	0.782	0.163
50301	1148.2	21.5	21.764	-97.36	27.358		0.782	-0.187
50301	1311.8	21.253	22.163	-97.37	27.354	170	0.771	1.524
50301	1316.7	21.254	22.12	-97.37	27.354	164	0.771	1.464

50301	1321.6	21.251	22.102	-97.37	27.354	140	0.771	1.224
50301	1326.5	21.25	22.093	-97.37	27.354	134	0.771	1.164
50301	1257	21.248	22.082	-97.37	27.354	121	0.777	1.028
50301	1306.9	21.253	22.074	-97.37	27.354	93	0.771	0.754
50301	1302	21.251	22.063	-97.37	27.354	85	0.771	0.674
50301	1252.1	21.249	22.003	-97.37	27.354	59	0.777	0.408
50301	1247.2	21.25	21.96	-97.37	27.354	44	0.777	0.258
50301	1242.3	21.25	21.95	-97.37	27.354	36	0.777	0.178
50301	1237.4	21.25	21.94	-97.37	27.354	30	0.777	0.118
50301	1232.5	21.25	21.93	-97.37	27.354	31	0.777	0.128
50301	1227.5	21.25	21.919	-97.37	27.354		0.777	-0.182
31231	1030	20.997	23.132	-97.39	27.35	178	0.026	1.754
31231	1034.1	20.998	23.12	-97.39	27.35	132	0.026	1.294
31231	1038.1	20.999	23.103	-97.39	27.35	144	0.026	1.414
31231	1107.1	21.002	23.084	-97.38	27.35	144	0.019	1.421
31231	1111.1	21.001	23.072	-97.38	27.35	136	0.019	1.341
31231	1103	21.001	23.062	-97.38	27.35	115	0.019	1.131
31231	1058.5	21.004	23.042	-97.38	27.35	114	0.026	1.114
31231	1046.3	21.001	23.001	-97.38	27.35	50	0.026	0.474
31231	1050.4	21.001	23.001	-97.38	27.35	50	0.026	0.474
31231	1042.2	21.001	23.001	-97.38	27.35	50	0.026	0.474
31231	1054.4	21.001	23.001	-97.38	27.35	50	0.026	0.474
50607	1532.7	20.978	22.872	-97.38	27.35	93	0.693	0.832
50607	1551.2	21.002	22.863	-97.38	27.35	85	0.693	0.752
50607	1560.4	21.014	22.853	-97.38	27.35	101	0.693	0.912
50607	1541.9	21.023	22.849	-97.38	27.35	130	0.693	1.202
31231	1119.3	21.004	22.831	-97.38	27.35	125	0.019	1.231
31231	1127.4	21.003	22.822	-97.38	27.35	130	0.019	1.281
31231	1123.4	21.003	22.812	-97.38	27.35	134	0.019	1.321
31231	1115.2	20.999	22.753	-97.38	27.35	174	0.019	1.721
31231	1131.5	21.001	22.499	-97.37	27.35	166	0.019	1.641
31231	1139.7	20.999	22.444	-97.37	27.35	132	0.019	1.301
31231	1135.6	21.002	22.419	-97.37	27.35	73	0.019	0.711
31231	1143.7	20.997	22.411	-97.37	27.35	48	0.019	0.461
31231	1147.8	20.997	22.4	-97.37	27.35	26	0.019	0.241
31231	1151.9	20.997	22.39	-97.37	27.35	45	0.019	0.431
31231	1156	20.997	22.38	-97.37	27.35	37	0.019	0.351
31231	1200	20.997	22.37	-97.37	27.35	22	0.015	0.205
31231	1204.1	20.997	22.36	-97.37	27.35	29	0.015	0.275
31231	1208.1	20.997	22.35	-97.37	27.35	22	0.015	0.205
31231	1212.2	20.997	22.34	-97.37	27.35	21	0.015	0.195
31231	1216.3	20.997	22.33	-97.37	27.35	20	0.015	0.185
31231	1220	20.997	22.32	-97.37	27.35	23	0.015	0.215
50607	1400	20.749	23.146	-97.39	27.346	130	0.683	1.212
50607	1409.2	20.748	23.139	-97.39	27.346	126	0.683	1.172
50607	1436.9	20.747	23.046	-97.38	27.346	75	0.683	0.662
50607	1446.2	20.748	23.038	-97.38	27.346	130	0.683	1.212
50607	1427.7	20.75	23.034	-97.38	27.346	124	0.683	1.152
50607	1418.5	20.748	23.023	-97.38	27.346	126	0.683	1.172
50310	1357.3	20.753	22.64	-97.38	27.346	161	0.694	1.511
50310	1300	20.752	22.629	-97.38	27.346	127	0.694	1.171
50310	1308.2	20.751	22.618	-97.38	27.346	120	0.694	1.101
50310	1316.4	20.753	22.593	-97.38	27.346	29	0.694	0.191
50310	1349.1	20.75	22.542	-97.38	27.346	29	0.694	0.191
50310	1340.9	20.75	22.532	-97.38	27.346	30	0.694	0.201
50310	1324.5	20.75	22.522	-97.38	27.346	28	0.694	0.181
50310	1332.7	20.75	22.512	-97.38	27.346	26	0.694	0.161
50310	1243.9	20.713	22.75	-97.38	27.345	166	0.698	1.557

50310	1252.1	20.702	22.753	-97.38	27.345	150	0.698	1.397
50310	1235.7	20.693	22.749	-97.38	27.345	127	0.698	1.167
50607	1505	20.691	23.127	-97.39	27.345	60	0.693	0.502
50607	1514.2	20.68	23.15	-97.39	27.345	115	0.693	1.052
50607	1523.5	20.668	23.156	-97.39	27.344	150	0.693	1.402
50607	1455.4	20.652	23.152	-97.39	27.344	142	0.683	1.332
50310	1422.4	20.652	22.873	-97.38	27.344	136	0.692	1.263
50310	1406	20.642	22.869	-97.38	27.344	75	0.692	0.653
50301	1331.5	20.423	22.751	-97.38	27.34	31	0.771	0.134
50301	1336.4	20.41	22.75	-97.38	27.34	34	0.771	0.164
50524	1444.6	20.4	22.751	-97.38	27.34	11	0.561	0.144
50301	1341.3	20.4	22.75	-97.38	27.34	34	0.771	0.164
50301	1346.2	20.39	22.75	-97.38	27.34	35	0.771	0.174
50301	1351.1	20.38	22.75	-97.38	27.34	35	0.771	0.174
50301	1356	20.37	22.75	-97.38	27.34	34	0.771	0.164
50301	1401	20.36	22.75	-97.38	27.339	35	0.767	0.178
50301	1405.9	20.32	22.75	-97.38	27.339	33	0.767	0.158
50301	1410.8	20.28	22.75	-97.38	27.338	33	0.767	0.158
50301	1415.7	20.24	22.75	-97.38	27.337	33	0.767	0.158
50301	1420.6	20.2	22.75	-97.38	27.337	34	0.767	0.168
50310	1138.2	20.19	22.75	-97.38	27.337	27	0.701	0.164
50310	1130	20.18	22.75	-97.38	27.336	27	0.701	0.164
50301	1430.5	20.17	22.75	-97.38	27.336	34	0.767	0.168
50301	1425.5	20.16	22.75	-97.38	27.336	34	0.767	0.168
50524	1441.7	20.4	22.711	-97.38	27.34	15	0.561	0.184
50524	1438.9	20.4	22.671	-97.38	27.34	17	0.561	0.204
50524	1436.1	20.4	22.631	-97.38	27.34	15	0.561	0.184
50524	1427.5	20.4	22.621	-97.38	27.34	15	0.561	0.184
50524	1430.4	20.4	22.611	-97.38	27.34	15	0.561	0.184
50524	1433.2	20.4	22.601	-97.38	27.34	13	0.561	0.164
50524	1407.7	20.4	22.49	-97.37	27.34	4	0.561	0.074
50524	1410.5	20.4	22.48	-97.37	27.34	4	0.561	0.074
50524	1413.4	20.4	22.47	-97.37	27.34	2	0.561	0.054
50524	1416.2	20.4	22.46	-97.37	27.34	2	0.561	0.054
50524	1419	20.4	22.45	-97.37	27.34	1	0.561	0.044
50524	1421.9	20.4	22.44	-97.37	27.34	1	0.561	0.044
50524	1424.7	20.4	22.43	-97.37	27.34	1	0.561	0.044
50310	1211.2	20.375	22.894	-97.38	27.34	23	0.698	0.127
50310	1203	20.364	22.894	-97.38	27.339	7	0.698	-0.033
50310	1219.4	20.354	22.893	-97.38	27.339	11	0.698	0.007
50310	1227.5	20.344	22.893	-97.38	27.339	14	0.698	0.037
50310	1154.5	20.364	22.883	-97.38	27.339	7	0.701	-0.036
50310	1146.4	20.365	22.873	-97.38	27.339	14	0.701	0.034
21011	1240	20.001	23.591	-97.39	27.333	182	0.325	1.495
21011	1245	20.002	23.58	-97.39	27.333	64	0.325	0.315
21003	1500	20.001	23.502	-97.39	27.333	86	0.394	0.466
21003	1500	20.001	23.502	-97.39	27.333	86	0.394	0.466
21003	1500	20.001	23.502	-97.39	27.333	86	0.394	0.466
21003	1500	20.001	23.502	-97.39	27.333	86	0.394	0.466
21003	1443.9	20	23.372	-97.39	27.333	59	0.395	0.195
21003	1460.3	20.003	23.363	-97.39	27.333	55	0.394	0.156
21003	1452.1	20.001	23.352	-97.39	27.333	51	0.395	0.115
21003	1435.7	19.999	23.332	-97.39	27.333	46	0.395	0.065
21003	1403	20.004	23.25	-97.39	27.333	38	0.395	-0.015
21003	1427.5	20.002	23.223	-97.39	27.333	38	0.395	-0.015
21003	1419.4	19.998	23.212	-97.39	27.333	39	0.395	-0.005
21003	1411.2	20.001	23.171	-97.39	27.333	45	0.395	0.055
21003	1320	20.003	23.006	-97.38	27.333	55	0.393	0.157

21003	1320	20.003	23.006	-97.38	27.333	55	0.393	0.157
21003	1320	20.003	23.006	-97.38	27.333	55	0.393	0.157
21003	1320	20.003	23.006	-97.38	27.333	55	0.393	0.157
21003	1330	19.998	22.842	-97.38	27.333	55	0.393	0.157
21003	1346.4	20	22.813	-97.38	27.333	55	0.393	0.157
21003	1338.2	20.003	22.801	-97.38	27.333	54	0.393	0.147
21003	1354.5	20.002	22.791	-97.38	27.333	52	0.393	0.127
50524	1300	20	22.75	-97.38	27.333	16	0.562	0.193
21003	1310	20.001	22.748	-97.38	27.333	51		0.51
50524	1302.8	20	22.71	-97.38	27.333	11	0.562	0.143
50524	1311.4	20	22.69	-97.38	27.333	14	0.562	0.173
50524	1308.5	20	22.68	-97.38	27.333	14	0.562	0.173
50524	1305.7	20	22.67	-97.38	27.333	14	0.562	0.173
50524	1314.2	20	22.66	-97.38	27.333	14	0.562	0.173
50524	1317	20	22.62	-97.38	27.333	14	0.562	0.173
50524	1319.9	20	22.58	-97.38	27.333	15	0.562	0.183
50524	1322.7	20	22.54	-97.38	27.333	15	0.562	0.183
50524	1404.8	20	22.53	-97.38	27.333	15	0.561	0.184
50524	1402	20	22.52	-97.38	27.333	15	0.561	0.184
50524	1359.6	20	22.51	-97.38	27.333	16	0.562	0.193
50524	1325.5	20	22.5	-97.38	27.333	14	0.562	0.173
50524	1328.4	20	22.49	-97.37	27.333	11	0.562	0.143
50524	1331.2	20	22.48	-97.37	27.333	10	0.562	0.133
50524	1334.1	20	22.47	-97.37	27.333	9	0.562	0.123
50524	1336.9	20	22.46	-97.37	27.333	8	0.562	0.113
50524	1339.7	20	22.45	-97.37	27.333	5	0.562	0.083
50524	1342.6	20	22.44	-97.37	27.333	5	0.562	0.083
50524	1345.4	20	22.43	-97.37	27.333	4	0.562	0.073
50524	1348.2	20	22.42	-97.37	27.333	1	0.562	0.043
50524	1351.1	20	22.41	-97.37	27.333	1	0.562	0.043
50524	1353.9	20	22.4	-97.37	27.333	0	0.562	0.033
50524	1356.8	20	22.39	-97.37	27.333	0	0.562	0.033
21011	1250	19	22.79	-97.38	27.317	65	0.325	0.325
21011	1300	19.001	22.752	-97.38	27.317	65	0.322	0.328
21011	1300	19.001	22.752	-97.38	27.317	65	0.322	0.328
21011	1300	19.001	22.752	-97.38	27.317	65	0.322	0.328
21011	1300	19.001	22.752	-97.38	27.317	65	0.322	0.328
21011	1320	19.002	22.501	-97.38	27.317	54	0.322	0.218
21011	1320	19.002	22.501	-97.38	27.317	54	0.322	0.218
21011	1320	19.002	22.501	-97.38	27.317	54	0.322	0.218
21011	1320	19.002	22.501	-97.38	27.317	54	0.322	0.218
21011	1348.9	18.999	22.384	-97.37	27.317	51	0.322	0.188
21011	1357.8	19.001	22.362	-97.37	27.317	50	0.322	0.178
21011	1407	18.997	22.353	-97.37	27.317	51	0.314	0.196
21011	1340	19	22.342	-97.37	27.317	50	0.322	0.178
21011	1415.9	19.001	22.332	-97.37	27.317	49	0.314	0.176
50310	1430.5	18.501	22.942	-97.38	27.308	59	0.692	0.493
50310	1438.7	18.501	22.862	-97.38	27.308	53	0.692	0.433
50310	1446.9	18.5	22.783	-97.38	27.308	50	0.692	0.403
50310	1455.1	18.498	22.701	-97.38	27.308	48	0.692	0.383
50310	1503	18.499	22.623	-97.38	27.308	42	0.684	0.331
50310	1511.2	18.502	22.541	-97.38	27.308	39	0.684	0.301
50310	1519.4	18.501	22.461	-97.37	27.308	34	0.684	0.251
50310	1527.5	18.5	22.42	-97.37	27.308	30	0.684	0.211
50310	1535.7	18.5	22.38	-97.37	27.308	28	0.684	0.191
50310	1552.1	18.5	22.35	-97.37	27.308	22	0.684	0.131
50310	1543.9	18.5	22.34	-97.37	27.308	20	0.684	0.111
50310	1560.3	18.5	22.33	-97.37	27.308	20	0.684	0.111

21016	1114.8	17.996	23.083	-97.38	27.3	56	0.291	0.269
21016	1110	18.007	23.003	-97.38	27.3	55	0.291	0.259
21016	1119.7	17.997	22.922	-97.38	27.3	56	0.291	0.269
21016	1124.5	18	22.843	-97.38	27.3	55	0.291	0.259
21016	1129.3	18.001	22.801	-97.38	27.3	54	0.291	0.249
21016	1134.1	17.997	22.778	-97.38	27.3	51	0.291	0.219
21016	1143.8	18.001	22.772	-97.38	27.3	52	0.291	0.229
21016	1139	18.001	22.76	-97.38	27.3	53	0.291	0.239
21016	1049	18.002	22.752	-97.38	27.3	52	0.287	0.233
21016	1049	18.002	22.752	-97.38	27.3	52	0.287	0.233
21016	1049	18.002	22.752	-97.38	27.3	52	0.287	0.233
21016	1049	18.002	22.752	-97.38	27.3	52	0.287	0.233
21011	1433.7	18.002	22.742	-97.38	27.3	50	0.314	0.186
21011	1500	18	22.732	-97.38	27.3	50	0.302	0.198
21011	1442.6	18.002	22.721	-97.38	27.3	51	0.314	0.196
21011	1424.8	18.001	22.703	-97.38	27.3	50	0.314	0.186
21016	1241.6	17.5	24.242	-97.4	27.292	0	0.291	-0.291
21016	1236.8	17.501	24.162	-97.4	27.292	139	0.291	1.099
21016	1246.4	17.506	24.141	-97.4	27.292	149	0.291	1.199
21016	1251.3	17.502	24.13	-97.4	27.292	153	0.291	1.239
21016	1232	17.502	24.123	-97.4	27.292	154	0.291	1.249
21016	1227.1	17.502	24.081	-97.4	27.292	157	0.291	1.279
21016	1222.3	17.504	24.003	-97.4	27.292	160	0.291	1.309
21016	1217.5	17.501	23.752	-97.4	27.292	160	0.291	1.309
21016	1158.3	17.504	23.633	-97.39	27.292	157	0.291	1.279
21016	1207.8	17.502	23.613	-97.39	27.292	163	0.291	1.339
21016	1212.7	17.504	23.6	-97.39	27.292	160	0.291	1.309
21016	1203	17.503	23.592	-97.39	27.292	158	0.291	1.289
21016	1153.4	17.503	23.552	-97.39	27.292	157	0.291	1.279
21016	1148.6	17.498	23.513	-97.39	27.292	145	0.291	1.159
50317	1334.4	17.502	23.203	-97.39	27.292	29	0.612	0.273
50317	1360.4	17.5	23.193	-97.39	27.292	26	0.612	0.243
50317	1357.1	17.5	23.183	-97.39	27.292	28	0.612	0.263
50317	1353.9	17.5	23.173	-97.39	27.292	27	0.612	0.253
50317	1350.6	17.5	23.163	-97.39	27.292	27	0.612	0.253
50317	1347.4	17.5	23.153	-97.39	27.292	27	0.612	0.253
50317	1344.2	17.5	23.143	-97.39	27.292	27	0.612	0.253
50317	1340.9	17.5	23.133	-97.39	27.292	27	0.612	0.253
50317	1337.7	17.5	23.123	-97.39	27.292	26	0.612	0.243
21016	1301	16.999	23.703	-97.4	27.283	174	0.288	1.452
21016	1305.8	17.001	23.663	-97.39	27.283	162	0.288	1.332
21016	1315.5	17.006	23.653	-97.39	27.283	158	0.288	1.292
21016	1310.7	17.005	23.64	-97.39	27.283	123	0.288	0.942
21016	1256.1	17.002	23.621	-97.39	27.283	108	0.291	0.789
21016	1320.3	17.001	23.35	-97.39	27.283	67	0.288	0.382
21016	1330	16.998	23.251	-97.39	27.283	59	0.288	0.302
21016	1330	16.998	23.251	-97.39	27.283	59	0.288	0.302
21016	1330	16.998	23.251	-97.39	27.283	59	0.288	0.302
21016	1330	16.998	23.251	-97.39	27.283	59	0.288	0.302
21016	1405	17.001	23.239	-97.39	27.283	60	0.285	0.315
21016	1410	17.002	23.228	-97.39	27.283	61	0.285	0.325
21016	1400	17	23.16	-97.39	27.283	54	0.285	0.255
21016	1355	16.998	23.081	-97.38	27.283	48	0.288	0.192
21016	1350	17.003	23.001	-97.38	27.283	36	0.288	0.072
21016	1415	15.998	23.602	-97.39	27.267	60	0.285	0.315
21016	1420	16.004	23.501	-97.39	27.267	59	0.285	0.305
21016	1420	16.004	23.501	-97.39	27.267	59	0.285	0.305
21016	1420	16.004	23.501	-97.39	27.267	59	0.285	0.305

21016	1420	16.004	23.501	-97.39	27.267	59	0.285	0.305	
21016	1450	16.002	23.442	-97.39	27.267	49	0.285	0.205	
21016	1500	16.004	23.433	-97.39	27.267	50	0.284	0.216	
21016	1455	16.006	23.42	-97.39	27.267	50	0.285	0.215	
21016	1445	16	23.406	-97.39	27.267	50	0.285	0.215	
21016	1440	16.007	23.244	-97.39	27.267	32	0.285	0.035	
50505	1200	15.09	23.74	-97.4	27.252	40	0.817	0.178	
50505	1204.9	15.08	23.74	-97.4	27.251	32	0.817	0.098	
50505	1209.7	15.07	23.74	-97.4	27.251	7	0.817	-0.152	
21114	1140	15.007	23.858	-97.4	27.25	41	0.444	-0.034	34
21114	1235.7	15.002	23.79	-97.4	27.25	47	0.189	0.281	
21114	1229.5	15.002	23.78	-97.4	27.25	41	0.189	0.221	
21114	1223.4	15.002	23.77	-97.4	27.25	32	0.189	0.131	
21114	1217.3	15.002	23.76	-97.4	27.25	25	0.189	0.061	
21114	1146.1	15.003	23.747	-97.4	27.25	16	0.189	-0.029	
21114	1211.1	15.002	23.74	-97.4	27.25	32	0.189	0.131	
21114	1205	15.002	23.73	-97.4	27.25	35	0.189	0.161	
21114	1158.4	15.002	23.72	-97.4	27.25	38	0.189	0.191	
21114	1152.3	15.002	23.7	-97.4	27.25	45	0.189	0.261	
21114	1248	15	23.681	-97.39	27.25	49	0.189	0.301	
21114	1254.1	15.002	23.67	-97.39	27.25	49	0.189	0.301	
21114	1241.8	15.004	23.661	-97.39	27.25	52	0.189	0.331	
21114	1300	15.006	23.503	-97.39	27.25	51	0.186	0.324	
21114	1300	15.006	23.503	-97.39	27.25	51	0.186	0.324	
21114	1300	15.006	23.503	-97.39	27.25	51	0.186	0.324	
21114	1300	15.006	23.503	-97.39	27.25	51	0.186	0.324	
21114	1325.5	15.003	23.331	-97.39	27.25	40	0.186	0.214	
21114	1331	15	23.312	-97.39	27.25	39	0.186	0.204	
21114	1342	15.007	23.3	-97.39	27.25	38	0.186	0.194	
21114	1336.5	15.001	23.293	-97.39	27.25	37	0.186	0.184	
21114	1320	14.998	23.252	-97.39	27.25	33	0.186	0.144	
50505	1214.6	14.994	23.74	-97.4	27.25	68	0.817	0.458	
50505	1219.4	14.981	23.738	-97.4	27.25	80	0.817	0.578	
50505	1224.3	14.969	23.74	-97.4	27.249	58	0.817	0.358	
21114	1500	14.005	24.061	-97.4	27.233	60	0.185	0.415	
21114	1455	14.001	24.003	-97.4	27.233	60	0.186	0.414	
21114	1455	14.001	24.003	-97.4	27.233	60	0.186	0.414	
21114	1455	14.001	24.003	-97.4	27.233	60	0.186	0.414	
21114	1455	14.001	24.003	-97.4	27.233	60	0.186	0.414	
21114	1435	14.006	23.753	-97.4	27.233	57	0.186	0.384	
21114	1435	14.006	23.753	-97.4	27.233	57	0.186	0.384	
21114	1435	14.006	23.753	-97.4	27.233	57	0.186	0.384	
21114	1435	14.006	23.753	-97.4	27.233	57	0.186	0.384	
21114	1415	14	23.501	-97.39	27.233	51	0.186	0.324	
21114	1415	14	23.501	-97.39	27.233	51	0.186	0.324	
21114	1415	14	23.501	-97.39	27.233	51	0.186	0.324	
21114	1415	14	23.501	-97.39	27.233	51	0.186	0.324	
21114	1358.5	13.998	23.454	-97.39	27.233	47	0.186	0.284	
21114	1404	14.003	23.432	-97.39	27.233	46	0.186	0.274	
21114	1409.5	14.002	23.421	-97.39	27.233	45	0.186	0.264	
21114	1353	14.006	23.41	-97.39	27.233	43	0.186	0.244	
21114	1347.5	14	23.246	-97.39	27.233	24	0.186	0.054	
21120	1143.2	13.04	24.148	-97.4	27.217		0.021	-0.021	
21120	1114	13.001	24.228	-97.4	27.217	86	0.021	0.839	32
21120	1119.8	13.004	24.191	-97.4	27.217	80	0.021	0.779	
21120	1131.5	13.005	24.174	-97.4	27.217	67	0.021	0.649	
21120	1137.4	13.002	24.161	-97.4	27.217	60	0.021	0.579	
21120	1125.7	13.002	24.152	-97.4	27.217	58	0.021	0.559	

21120	1149	13.001	23.998	-97.4	27.217	52	0.021	0.499
21120	1149	13.001	23.998	-97.4	27.217	52	0.021	0.499
21120	1149	13.001	23.998	-97.4	27.217	52	0.021	0.499
21120	1149	13.001	23.998	-97.4	27.217	52	0.021	0.499
21120	1209	12.996	23.751	-97.4	27.217	30	0.014	0.286
21120	1209	12.996	23.751	-97.4	27.217	30	0.014	0.286
21120	1209	12.996	23.751	-97.4	27.217	30	0.014	0.286
21120	1209	12.996	23.751	-97.4	27.217	30	0.014	0.286
21120	1229	13	23.71	-97.4	27.217	31	0.014	0.296
21120	1240.7	13	23.68	-97.39	27.217	27	0.014	0.256
21120	1234.8	13	23.67	-97.39	27.217	26	0.014	0.246
21120	1246.5	13	23.66	-97.39	27.217	25	0.014	0.236
21120	1252.4	13	23.65	-97.39	27.217	25	0.014	0.236
21120	1258.2	13	23.64	-97.39	27.217	24	0.014	0.226
21120	1304	13	23.63	-97.39	27.217	24	0.005	0.235
21120	1347	12.004	23.543	-97.39	27.2	169	0.005	1.685
21120	1358.7	12.004	23.533	-97.39	27.2	150	0.005	1.495
21120	1352.8	12.003	23.52	-97.39	27.2	117	0.005	1.165
21120	1327.4	12.002	23.499	-97.39	27.2	102	0.005	1.015
21120	1327	12.002	23.499	-97.39	27.2	102	0.005	1.015
21120	1327	12.002	23.499	-97.39	27.2	102	0.005	1.015
21120	1327	12.002	23.499	-97.39	27.2	102	0.005	1.015
21120	1309.8	12	23.408	-97.39	27.2	36	0.005	0.355
21120	1315.7	12.002	23.398	-97.39	27.2	31	0.005	0.305
21120	1321.5	12.002	23.388	-97.39	27.2	22	0.005	0.215
21120	1448.4	11.005	23.872	-97.4	27.183	165	0	1.65
21120	1454.2	11.001	23.85	-97.4	27.183	113	0	1.13
21120	1500	11.003	23.843	-97.4	27.183	71	-0.01	0.72
21120	1442.5	11.002	23.832	-97.4	27.183	59	0	0.59
21120	1405	11.003	23.754	-97.4	27.183	40	0	0.4
21120	1405	11.003	23.754	-97.4	27.183	40	0	0.4
21120	1405	11.003	23.754	-97.4	27.183	40	0	0.4
21120	1405	11.003	23.754	-97.4	27.183	40	0	0.4
21120	1425	11.004	23.744	-97.4	27.183	24	0	0.24
21120	1430.8	11.004	23.734	-97.4	27.183	32	0	0.32
21120	1436.7	11.004	23.724	-97.4	27.183	29	0	0.29
50317	1425.9	10.914	23.732	-97.4	27.182	24	0.617	0.218
50317	1422.7	10.904	23.732	-97.4	27.182	23	0.617	0.208
50317	1419.5	10.894	23.732	-97.4	27.182	21	0.617	0.188
50317	1416.2	10.884	23.732	-97.4	27.181	20	0.617	0.178
50317	1413	10.874	23.732	-97.4	27.181	25	0.617	0.228
50317	1409.7	10.864	23.732	-97.4	27.181	25	0.617	0.228
50317	1406.5	10.854	23.732	-97.4	27.181	17	0.617	0.148
50317	1403.2	10.844	23.732	-97.4	27.181	24	0.617	0.218
50317	1400	10.834	23.732	-97.4	27.181	45	0.617	0.428
50317	1451.9	10.812	23.73	-97.4	27.18	51	0.617	0.488
50317	1448.6	10.802	23.73	-97.4	27.18	35	0.617	0.328
50317	1445.4	10.792	23.73	-97.4	27.18	21	0.617	0.188
50317	1442.2	10.782	23.73	-97.4	27.18	27	0.617	0.248
50317	1438.9	10.772	23.73	-97.4	27.18	16	0.617	0.138
50317	1435.7	10.762	23.73	-97.4	27.179	6	0.617	0.038
50317	1432.4	10.752	23.73	-97.4	27.179	2	0.617	-0.002
50317	1429.2	10.742	23.73	-97.4	27.179		0.617	-0.022
50317	1455.1	10.732	23.73	-97.4	27.179		0.617	-0.022
50317	1458.4	10.722	23.73	-97.4	27.179		0.617	-0.022
50317	1302	10.712	23.73	-97.4	27.179		0.612	-0.017
50317	1305.2	10.702	23.73	-97.4	27.178		0.612	-0.017
50317	1308.5	10.692	23.73	-97.4	27.178	1	0.612	-0.007

50317	1311.7	10.682	23.73	-97.4	27.178	9	0.612	0.073
50317	1315	10.672	23.73	-97.4	27.178	15	0.612	0.133
50317	1318.2	10.662	23.73	-97.4	27.178	16	0.612	0.143
50317	1321.5	10.652	23.73	-97.4	27.178	20	0.612	0.183
50317	1324.7	10.642	23.73	-97.4	27.177	22	0.612	0.203
50317	1327.9	10.632	23.73	-97.4	27.177	23	0.612	0.213
50317	1331.2	10.622	23.73	-97.4	27.177	26	0.612	0.243
50214	1658.5	10.602	24.254	-97.4	27.177	139	0.77	1.215
50214	1651.4	10.601	24.243	-97.4	27.177	124	0.77	1.065
50214	1644.4	10.605	24.231	-97.4	27.177	100	0.77	0.825
50214	1630.2	10.605	24.15	-97.4	27.177	66	0.77	0.485
50214	1534.2	10.601	24.061	-97.4	27.177	62	0.772	0.443
50214	1541.3	10.603	23.893	-97.4	27.177	50	0.772	0.323
50214	1548.4	10.599	23.812	-97.4	27.177	50	0.772	0.323
50214	1555.4	10.602	23.731	-97.4	27.177	46	0.772	0.283
50214	1602	10.598	23.694	-97.39	27.177	34	0.77	0.165
50214	1609.1	10.6	23.68	-97.39	27.177	34	0.77	0.165
50214	1616.1	10.6	23.67	-97.39	27.177	31	0.77	0.135
50214	1623.2	10.6	23.66	-97.39	27.177	30	0.77	0.125
50214	1637.3	10.6	23.313	-97.39	27.177	144	0.77	1.265
50214	1459.5	10.48	24.594	-97.41	27.175	210	0.777	1.918
50214	1506	10.439	24.593	-97.41	27.174	165	0.772	1.473
50214	1520.1	10.424	24.592	-97.41	27.174	145	0.772	1.273
50214	1527.2	10.409	24.593	-97.41	27.173	96	0.772	0.783
50214	1513.1	10.401	24.593	-97.41	27.173	88	0.772	0.703
50505	1229.1	10.299	24.501	-97.41	27.172	66	0.817	0.438
50505	1234	10.218	24.501	-97.41	27.17	60	0.817	0.378
50505	1238.8	10.139	24.504	-97.41	27.169	54	0.817	0.318
50505	1243.7	10.057	24.503	-97.41	27.168	51	0.817	0.288
50512	1356.3	10.05	24.34	-97.41	27.168	25	0.702	0.143
50512	1349.1	10.04	24.34	-97.41	27.167	24	0.702	0.133
50512	1352.7	10.03	24.34	-97.41	27.167	24	0.702	0.133
50512	1400	10.02	24.34	-97.41	27.167	20	0.702	0.093
21121	1127	10.004	24.772	-97.41	27.167	40	0.01	0.39
21121	1140	10.005	24.748	-97.41	27.167	40	0.01	0.39
21121	1140	10.005	24.748	-97.41	27.167	40	0.01	0.39
21121	1140	10.005	24.748	-97.41	27.167	40	0.01	0.39
21121	1140	10.005	24.748	-97.41	27.167	40	0.01	0.39
21121	1226	10.001	24.603	-97.41	27.167	36	0.008	0.352
21121	1239	10.003	24.591	-97.41	27.167	34	0.008	0.332
21121	1213	10.006	24.58	-97.41	27.167	34	0.008	0.332
21121	1252	10.001	24.57	-97.41	27.167	34	0.008	0.332
30925	1200	10	24.499	-97.41	27.167	65	0.396	0.254
21121	1200	10	24.497	-97.41	27.167	24	0.008	0.232
50512	1345.5	10	24.34	-97.41	27.167	20	0.702	0.093
30925	1221	10.003	24.248	-97.4	27.167	49	0.396	0.094
30925	1427	10	24.121	-97.4	27.167	64	0.396	0.244
30925	1303	10.003	24.114	-97.4	27.167	65	0.396	0.254
30925	1406	9.991	24.106	-97.4	27.167	73	0.396	0.334
30925	1345	9.999	24.084	-97.4	27.167	85	0.396	0.454
30925	1447	9.998	24.076	-97.4	27.167	64	0.396	0.244
30925	1324	10.001	24.072	-97.4	27.167	63	0.396	0.234
30925	1507	9.997	24.063	-97.4	27.167	66	0.397	0.263
30925	1242	10.001	23.998	-97.4	27.167	72	0.396	0.324
30925	1242	10.001	23.998	-97.4	27.167	72	0.396	0.324
30925	1242	10.001	23.998	-97.4	27.167	72	0.396	0.324
30925	1242	10.001	23.998	-97.4	27.167	72	0.396	0.324
31001	1210	10.005	23.832	-97.4	27.167	79	0.441	0.349

31001	1230	10.004	23.822	-97.4	27.167	76	0.441	0.319
31001	1220	10.001	23.813	-97.4	27.167	76	0.441	0.319
31001	1200	10.001	23.794	-97.4	27.167	73	0.441	0.289
31001	1150	9.998	23.753	-97.4	27.167	64	0.441	0.199
21121	1305	10			27.167			
50505	1303	9.98	24.701	-97.41	27.166	54	0.813	0.322
50505	1307.9	9.901	24.703	-97.41	27.165	44	0.813	0.222
50505	1322.4	9.843	24.701	-97.41	27.164	37	0.813	0.152
50505	1317.6	9.833	24.701	-97.41	27.164	36	0.813	0.142
50505	1312.7	9.823	24.701	-97.41	27.164	36	0.813	0.142
50214	1424.2	9.921	24.593	-97.41	27.165	34	0.777	0.158
50214	1431.2	9.898	24.596	-97.41	27.165	39	0.777	0.208
50214	1445.4	9.893	24.592	-97.41	27.165	37	0.777	0.188
50214	1438.3	9.881	24.594	-97.41	27.165	37	0.777	0.188
50214	1452.4	9.87	24.596	-97.41	27.165	37	0.777	0.188
50505	1253.4	9.989	24.506	-97.41	27.166	40	0.817	0.178
50505	1258.2	9.968	24.504	-97.41	27.166	38	0.817	0.158
50505	1248.5	9.978	24.5	-97.41	27.166	39	0.817	0.168
50512	1327.4	9.5	24.86	-97.41	27.158	20	0.702	0.093
50512	1323.7	9.5	24.85	-97.41	27.158	20	0.702	0.093
50512	1331	9.5	24.84	-97.41	27.158	19	0.702	0.083
50512	1334.6	9.5	24.83	-97.41	27.158	20	0.702	0.093
50512	1338.2	9.5	24.82	-97.41	27.158	20	0.702	0.093
50512	1320.1	9.5	24.81	-97.41	27.158	20	0.702	0.093
50512	1341.8	9.5	24.8	-97.41	27.158	19	0.702	0.083
50512	1316.5	9.5	24.77	-97.41	27.158	20	0.702	0.093
50512	1312.9	9.5	24.76	-97.41	27.158	19	0.702	0.083
50512	1309.2	9.5	24.75	-97.41	27.158	19	0.702	0.083
50512	1305.6	9.5	24.727	-97.41	27.158	19	0.702	0.083
50512	1302	9.5	24.687	-97.41	27.158	20	0.702	0.093
50512	1258	9.5	24.647	-97.41	27.158	19	0.7	0.085
50512	1250.7	9.5	24.607	-97.41	27.158	16	0.7	0.055
50512	1254.3	9.5	24.597	-97.41	27.158	16	0.7	0.055
50512	1247.1	9.5	24.567	-97.41	27.158	16	0.7	0.055
50512	1243.5	9.5	24.527	-97.41	27.158	15	0.7	0.045
50512	1239.8	9.5	24.487	-97.41	27.158	14	0.7	0.035
50512	1236.2	9.5	24.447	-97.41	27.158	12	0.7	0.015
50512	1232.6	9.5	24.407	-97.41	27.158	8	0.7	-0.025
50512	1229	9.5	24.397	-97.41	27.158	3	0.7	-0.075
50512	1225.4	9.5	24.387	-97.41	27.158		0.7	-0.105
50512	1221.7	9.5	24.377	-97.41	27.158		0.7	-0.105
50512	1218.1	9.5	24.367	-97.41	27.158		0.7	-0.105
50512	1214.5	9.5	24.366	-97.41	27.158	20	0.7	0.095
50512	1207.2	9	24.94	-97.42	27.15	19	0.7	0.085
50512	1203.6	9	24.93	-97.42	27.15	19	0.7	0.085
31001	1330	9.001	24.925	-97.42	27.15	64	0.44	0.2
50512	1200	9	24.92	-97.42	27.15	19	0.7	0.085
50512	1156.3	9	24.91	-97.42	27.15	18	0.702	0.073
50512	1152.7	9	24.9	-97.42	27.15	19	0.702	0.083
50512	1149.1	9	24.89	-97.41	27.15	19	0.702	0.083
50512	1145.5	9	24.88	-97.41	27.15	17	0.702	0.063
31001	1320	9.006	24.871	-97.41	27.15	63	0.44	0.19
50512	1141.8	9	24.87	-97.41	27.15	15	0.702	0.043
50512	1138.2	9	24.86	-97.41	27.15	15	0.702	0.043
31001	1350	9.002	24.851	-97.41	27.15	60	0.44	0.16
50512	1134.6	9	24.85	-97.41	27.15	13	0.702	0.023
31001	1340	9.004	24.844	-97.41	27.15	60	0.44	0.16
50512	1131	9	24.84	-97.41	27.15	10	0.702	-0.007

31001	1310	9.004	24.833	-97.41	27.15	55	0.44	0.11
50512	1127.4	9	24.83	-97.41	27.15	9	0.702	-0.017
50512	1123.7	9	24.82	-97.41	27.15	7	0.702	-0.037
50512	1120.1	9	24.81	-97.41	27.15	5	0.702	-0.057
50512	1116.5	9	24.8	-97.41	27.15	1	0.702	-0.097
50512	1112.9	9	24.79	-97.41	27.15	0	0.702	-0.107
31001	1300	9.003	24.79	-97.41	27.15	51	0.44	0.07
50512	1109.2	9	24.78	-97.41	27.15	1	0.702	-0.097
50512	1105.6	9	24.77	-97.41	27.15	1	0.702	-0.097
50512	1102	9	24.76	-97.41	27.15		0.702	-0.107
31001	1250	8.999	24.753	-97.41	27.15	45	0.441	0.009
31001	1250	8.999	24.753	-97.41	27.15	45	0.441	0.009
31001	1250	8.999	24.753	-97.41	27.15	45	0.441	0.009
31001	1250	8.999	24.753	-97.41	27.15	45	0.441	0.009
50512	1058.9	9	24.75	-97.41	27.15		0.7	-0.105
50512	1055.2	9	24.74	-97.41	27.15	6	0.7	-0.045
50512	1048	9	24.73	-97.41	27.15	22	0.7	0.115
50512	1051.6	9	24.723	-97.41	27.15	45	0.7	0.345
21121	1318	9	24.701	-97.41	27.15	22	-0.01	0.23
21121	1331	9	24.66	-97.41	27.15	23	-0.01	0.24
21121	1344	9	24.58	-97.41	27.15	24	-0.01	0.25
31001	1240	9.003	24.501	-97.41	27.15	64	0.441	0.199
31001	1240	9.003	24.501	-97.41	27.15	64	0.441	0.199
31001	1240	9.003	24.501	-97.41	27.15	64	0.441	0.199
31001	1240	9.003	24.501	-97.41	27.15	64	0.441	0.199
21121	1357	9	24.5	-97.41	27.15	24	-0.01	0.25
21121	1357	9	24.5	-97.41	27.15	24	-0.01	0.25
21121	1357	9	24.5	-97.41	27.15	24	-0.01	0.25
21121	1357	9	24.5	-97.41	27.15	24	-0.01	0.25
21121	1427	9	24.42	-97.41	27.15	24	-0.02	0.26
21121	1440	9	24.34	-97.41	27.15	25	-0.02	0.27
31001	1400	9	24.253	-97.4	27.15	68	0.436	0.244
31001	1410	9.005	24.212	-97.4	27.15	69	0.436	0.254
31001	1420	9.006	24.172	-97.4	27.15	69	0.436	0.254
31001	1430	9.003	24.133	-97.4	27.15	69	0.436	0.254
31006	1115	9.001	24.092	-97.4	27.15	65	0.372	0.278
31006	1151	9.004	24.081	-97.4	27.15	65	0.372	0.278
31006	1139	9.003	24.072	-97.4	27.15	65	0.372	0.278
31006	1127	9.001	24.053	-97.4	27.15	64	0.372	0.268
31001	1440	9.001	24.002	-97.4	27.15	68	0.436	0.244
31001	1450	9.005	23.937	-97.4	27.15	68	0.436	0.244
31001	1500	9.003	23.863	-97.4	27.15	62	0.434	0.186
50512	1210.9	8.912	25.039	-97.42	27.149		0.7	-0.105
50505	1341.8	8.498	25.065	-97.42	27.142	36	0.813	0.142
50505	1337	8.501	25.05	-97.42	27.142	37	0.813	0.152
50505	1332.1	8.501	25.04	-97.42	27.142	37	0.813	0.152
50505	1346.7	8.503	25.03	-97.42	27.142	37	0.813	0.152
50505	1327.3	8.5	25	-97.42	27.142	34	0.813	0.122
50505	1351.5	8.5	24.99	-97.42	27.142	30	0.813	0.082
50505	1356.4	8.5	24.98	-97.42	27.142	29	0.813	0.072
50505	1401	8.5	24.97	-97.42	27.142	29	0.807	0.078
50505	1405.9	8.5	24.96	-97.42	27.142	29	0.807	0.078
50505	1410.7	8.5	24.95	-97.42	27.142	29	0.807	0.078
50505	1415.6	8.5	24.94	-97.42	27.142	28	0.807	0.068
50505	1420.4	8.5	24.93	-97.42	27.142	25	0.807	0.038
50505	1425.3	8.5	24.92	-97.42	27.142	24	0.807	0.028
50505	1430.1	8.5	24.88	-97.41	27.142	18	0.807	-0.032
50505	1444.7	8.5	24.85	-97.41	27.142	16	0.807	-0.052

50505	1435	8.5	24.84	-97.41	27.142	29	0.807	0.078
50505	1439.8	8.5	24.83	-97.41	27.142	37	0.807	0.158
50214	1300	8.501	24.822	-97.41	27.142	50	0.779	0.316
50214	1307.1	8.5	24.779	-97.41	27.142	40	0.779	0.216
50214	1314.1	8.498	24.738	-97.41	27.142	41	0.779	0.226
50214	1321.2	8.501	24.701	-97.41	27.142	40	0.779	0.216
50214	1328.2	8.5	24.661	-97.41	27.142	40	0.779	0.216
50214	1335.3	8.501	24.619	-97.41	27.142	40	0.779	0.216
50214	1342.4	8.498	24.6	-97.41	27.142	40	0.779	0.216
50214	1349.4	8.501	24.561	-97.41	27.142	40	0.779	0.216
50214	1356.5	8.499	24.52	-97.41	27.142	38	0.779	0.196
50214	1410.1	8.5	24.502	-97.41	27.142	39	0.777	0.208
50214	1417.1	8.501	24.491	-97.41	27.142	38	0.777	0.198
50214	1403	8.502	24.481	-97.41	27.142	38	0.777	0.198
31006	1303	7.998	25.042	-97.42	27.133	60	0.38	0.22
31006	1251	8	25.004	-97.42	27.133	59	0.377	0.213
31006	1251	8	25.004	-97.42	27.133	59	0.377	0.213
31006	1251	8	25.004	-97.42	27.133	59	0.377	0.213
31006	1251	8	25.004	-97.42	27.133	59	0.377	0.213
31006	1327	8.003	24.963	-97.42	27.133	55	0.38	0.17
31006	1351	8.003	24.954	-97.42	27.133	54	0.38	0.16
31006	1339	8	24.941	-97.42	27.133	54	0.38	0.16
31006	1315	8.003	24.922	-97.42	27.133	53	0.38	0.15
31006	1239	8.003	24.752	-97.41	27.133	50	0.377	0.123
31006	1227	8.002	24.501	-97.41	27.133	54	0.377	0.163
31006	1215	8.004	24.253	-97.4	27.133	54	0.377	0.163
31006	1203	8.002	24.002	-97.4	27.133	54	0.377	0.163
31028	1230	7.004	25.143	-97.42	27.117	51	0.216	0.294
31028	1250	7.002	25.001	-97.42	27.117	44	0.216	0.224
31028	1250	7.002	25.001	-97.42	27.117	44	0.216	0.224
31028	1250	7.002	25.001	-97.42	27.117	44	0.216	0.224
31028	1310	7.001	24.747	-97.41	27.117	34	0.207	0.133
31028	1310	7.001	24.747	-97.41	27.117	34	0.207	0.133
31028	1310	7.001	24.747	-97.41	27.117	34	0.207	0.133
31028	1310	7.001	24.747	-97.41	27.117	34	0.207	0.133
31028	1330	7.003	24.505	-97.41	27.117	35	0.207	0.143
31028	1330	7.003	24.505	-97.41	27.117	35	0.207	0.143
31028	1330	7.003	24.505	-97.41	27.117	35	0.207	0.143
31028	1330	7.003	24.505	-97.41	27.117	35	0.207	0.143
31006	1415	6.998	24.253	-97.4	27.117	54	0.379	0.161
31006	1451	7.005	24.233	-97.4	27.117	54	0.379	0.161
31006	1500	7.006	24.22	-97.4	27.117	55	0.384	0.166
31006	1439	7.003	24.215	-97.4	27.117	55	0.379	0.171
31006	1427	7.004	24.171	-97.4	27.117	54	0.379	0.161
31006	1403	7.001	23.999	-97.4	27.117	51	0.379	0.131
31023	1424	6.001	25.233	-97.42	27.1	55	0.224	0.326
31023	1431	6.004	24.999	-97.42	27.1	54	0.224	0.316
31023	1431	6.004	24.999	-97.42	27.1	54	0.224	0.316
31023	1431	6.004	24.999	-97.42	27.1	54	0.224	0.316
31023	1431	6.004	24.999	-97.42	27.1	54	0.224	0.316
31023	1438	6.002	24.749	-97.41	27.1	66	0.224	0.436
31023	1438	6.002	24.749	-97.41	27.1	66	0.224	0.436
31023	1445	6.006	24.501	-97.41	27.1	67	0.224	0.446
31023	1445	6.006	24.501	-97.41	27.1	67	0.224	0.446
31023	1445	6.006	24.501	-97.41	27.1	67	0.224	0.446
31023	1445	6.006	24.501	-97.41	27.1	67	0.224	0.446
31023	1644	6.001	24.421	-97.41	27.1	68	0.214	0.466
31023	1651	6.001	24.381	-97.41	27.1	67	0.214	0.456

31023	1658	6.004	24.36	-97.41	27.1	67	0.214	0.456
31023	1637	6.005	24.333	-97.41	27.1	66	0.214	0.446
31023	1452	6.003	24.25	-97.4	27.1	59	0.224	0.366
31023	1609	6.001	24.173	-97.4	27.1	59	0.214	0.376
31023	1623	5.999	24.114	-97.4	27.1	59	0.214	0.376
31023	1630	6.003	24.103	-97.4	27.1	57	0.214	0.356
31023	1616	6.003	24.091	-97.4	27.1	57	0.214	0.356
31023	1459	6.004	23.998	-97.4	27.1	49	0.224	0.266
31023	1459	6.004	23.998	-97.4	27.1	49	0.224	0.266
31023	1459	6.004	23.998	-97.4	27.1	49	0.224	0.266
31023	1459	6.004	23.998	-97.4	27.1	49	0.224	0.266
31023	1506	5.998	23.747	-97.4	27.1	45	0.222	0.228
31023	1506	5.998	23.747	-97.4	27.1	45	0.222	0.228
31023	1513	6.006	23.711	-97.4	27.1	44	0.222	0.218
31023	1527	6.001	23.691	-97.39	27.1	44	0.222	0.218
31023	1534	6.002	23.682	-97.39	27.1	44	0.222	0.218
31023	1520	6.003	23.672	-97.39	27.1	43	0.222	0.208
31023	1541	6.003	23.662	-97.39	27.1	42	0.222	0.198
31023	1602	6.007	23.654	-97.39	27.1	42	0.214	0.206
31023	1555	6.005	23.643	-97.39	27.1	43	0.222	0.208
31023	1548	6.002	23.623	-97.39	27.1	43	0.222	0.208
31023	1417	5.003	25.285	-97.42	27.083	49	0.224	0.266
31023	1410	5.003	25.257	-97.42	27.083	46	0.224	0.236
31023	1410	5.003	25.257	-97.42	27.083	46	0.224	0.236
31023	1410	5.003	25.257	-97.42	27.083	46	0.224	0.236
31023	1410	5.003	25.257	-97.42	27.083	46	0.224	0.236
31023	1328	5.003	25.006	-97.42	27.083	68	0.224	0.456
31023	1356	5.006	24.994	-97.42	27.083	69	0.224	0.466
31023	1349	5.005	24.981	-97.42	27.083	70	0.224	0.476
31023	1403	5.005	24.973	-97.42	27.083	71	0.224	0.486
31023	1342	5.001	24.963	-97.42	27.083	73	0.224	0.506
31023	1335	5.004	24.92	-97.42	27.083	75	0.224	0.526
31016	1748	5.005	24.755	-97.41	27.083	112	0.304	0.816
31023	1253	5.004	24.583	-97.41	27.083	93	0.226	0.704
31023	1321	5.002	24.551	-97.41	27.083	90	0.224	0.676
31023	1300	5.004	24.54	-97.41	27.083	91	0.224	0.686
31023	1314	5.005	24.533	-97.41	27.083	89	0.224	0.666
31023	1307	5.004	24.521	-97.41	27.083	89	0.224	0.666
31016	1739	5	24.508	-97.41	27.083	106	0.304	0.756
31016	1739	5	24.508	-97.41	27.083	106	0.304	0.756
31016	1739	5	24.508	-97.41	27.083	106	0.304	0.756
31023	1218	5	24.344	-97.41	27.083	89	0.226	0.664
31023	1225	5.003	24.3	-97.41	27.083	85	0.226	0.624
31023	1239	4.998	24.294	-97.4	27.083	86	0.226	0.634
31023	1232	5.001	24.282	-97.4	27.083	85	0.226	0.624
31023	1246	4.998	24.272	-97.4	27.083	82	0.226	0.594
31016	1712	5.002	24.251	-97.4	27.083	104	0.304	0.736
31023	1211	5.002	24.011	-97.4	27.083	72	0.226	0.494
31016	1721	5.001	24.005	-97.4	27.083	90	0.304	0.596
31023	1204	5.002	23.994	-97.4	27.083	73	0.226	0.504
31023	1157	5	23.982	-97.4	27.083	73	0.233	0.497
31023	1150	5.002	23.971	-97.4	27.083	70	0.233	0.467
31023	1143	5.002	23.952	-97.4	27.083	70	0.233	0.467
31023	1136	5	23.913	-97.4	27.083	68	0.233	0.447
31023	1129	5.003	23.834	-97.4	27.083	64	0.233	0.407
31016	1730	5.007	23.751	-97.4	27.083	78	0.304	0.476
31016	1730	5.007	23.751	-97.4	27.083	78	0.304	0.476
31016	1730	5.007	23.751	-97.4	27.083	78	0.304	0.476

31016	1730	5.007	23.751	-97.4	27.083	78	0.304	0.476
31023	1047	5.001	23.703	-97.4	27.083	55	0.234	0.316
31023	1054	5.002	23.682	-97.39	27.083	53	0.234	0.296
31023	1101	4.998	23.671	-97.39	27.083	50	0.233	0.267
31023	1040	5.004	23.659	-97.39	27.083	46	0.234	0.226
31023	1108	5.003	23.651	-97.39	27.083	50	0.233	0.267
31023	1115	5	23.643	-97.39	27.083	50	0.233	0.267
31023	1122	5.001	23.632	-97.39	27.083	48	0.233	0.247
31016	1551	4.005	25.314	-97.42	27.067	94	0.319	0.621
31016	1542	4.001	25.257	-97.42	27.067	102	0.319	0.701
31016	1533	4.006	25.004	-97.42	27.067	127	0.319	0.951
31016	1524	4.001	24.753	-97.41	27.067	126	0.319	0.941
31016	1645	4.003	24.551	-97.41	27.067	120	0.314	0.886
31016	1703	4.005	24.543	-97.41	27.067	122	0.304	0.916
31016	1654	4.006	24.532	-97.41	27.067	118	0.314	0.866
31016	1636	4.002	24.515	-97.41	27.067	115	0.314	0.836
31016	1515	3.998	24.505	-97.41	27.067	119	0.319	0.871
31016	1627	4.004	24.494	-97.41	27.067	117	0.314	0.856
31016	1618	3.997	24.453	-97.41	27.067	115	0.314	0.836
31016	1609	4.002	24.413	-97.41	27.067	111	0.314	0.796
31016	1600	3.999	24.332	-97.41	27.067	104	0.314	0.726
31016	1336	4.006	24.258	-97.4	27.067	99	0.332	0.658
31016	1336	4.006	24.258	-97.4	27.067	99	0.332	0.658
31016	1336	4.006	24.258	-97.4	27.067	99	0.332	0.658
31016	1336	4.006	24.258	-97.4	27.067	99	0.332	0.658
31016	1345	4.001	24.181	-97.4	27.067	94	0.332	0.608
31016	1354	4	24.142	-97.4	27.067	85	0.332	0.518
31016	1403	3.999	24.133	-97.4	27.067	94	0.326	0.614
31016	1412	4.002	24.111	-97.4	27.067	84	0.326	0.514
31016	1421	3.999	24.09	-97.4	27.067	82	0.326	0.494
31016	1430	3.998	24.073	-97.4	27.067	81	0.326	0.484
31016	1448	4.004	24.052	-97.4	27.067	80	0.326	0.474
31016	1457	4.003	24.041	-97.4	27.067	79	0.326	0.464
31016	1439	4.001	24.033	-97.4	27.067	79	0.326	0.464
31016	1506	4.003	24.021	-97.4	27.067	89	0.319	0.571
31016	1318	4	24.002	-97.4	27.067	75	0.332	0.418
31016	1327	3.997	23.899	-97.4	27.067	60	0.332	0.268
31016	1018	2.998	25.342	-97.42	27.05	117	0.35	0.82
31016	1027	3.002	25.253	-97.42	27.05	120	0.35	0.85
31016	1027	3.002	25.253	-97.42	27.05	120	0.35	0.85
31016	1027	3.002	25.253	-97.42	27.05	120	0.35	0.85
31016	1027	3.002	25.253	-97.42	27.05	120	0.35	0.85
31016	1054	3.005	25.003	-97.42	27.05	118	0.35	0.83
31016	1054	3.005	25.003	-97.42	27.05	118	0.35	0.83
31016	1054	3.005	25.003	-97.42	27.05	118	0.35	0.83
31016	1054	3.005	25.003	-97.42	27.05	118	0.35	0.83
31016	1036	3.003	24.75	-97.41	27.05	117	0.35	0.82
31016	1036	3.003	24.75	-97.41	27.05	117	0.35	0.82
31016	1036	3.003	24.75	-97.41	27.05	117	0.35	0.82
31016	1036	3.003	24.75	-97.41	27.05	117	0.35	0.82
31016	1045	2.999	24.498	-97.41	27.05	115	0.35	0.8
31016	1045	2.999	24.498	-97.41	27.05	115	0.35	0.8
31016	1045	2.999	24.498	-97.41	27.05	115	0.35	0.8
31016	1045	2.999	24.498	-97.41	27.05	115	0.35	0.8
31016	1251	3.003	24.292	-97.4	27.05	103	0.339	0.691
31016	1300	3.002	24.271	-97.4	27.05	104	0.332	0.708
31016	1309	3	24.261	-97.4	27.05	103	0.332	0.698
31016	1103	3.001	24.253	-97.4	27.05	100	0.343	0.657

31016	1224	3.002	24.24	-97.4	27.05	99	0.339	0.651
31016	1242	3.006	24.233	-97.4	27.05	100	0.339	0.661
31016	1233	3	24.221	-97.4	27.05	99	0.339	0.651
31016	1215	3.003	24.203	-97.4	27.05	95	0.339	0.611
31016	1206	3.003	24.161	-97.4	27.05	93	0.339	0.591
31016	1130	3.001	24.084	-97.4	27.05	83	0.343	0.487
31016	1148	3.004	24.062	-97.4	27.05	82	0.343	0.477
31016	1157	3.005	24.05	-97.4	27.05	81	0.343	0.467
31016	1139	3.003	24.041	-97.4	27.05	78	0.343	0.437
31016	1112	3.002	24.001	-97.4	27.05	73	0.343	0.387
31016	1121	3	23.819	-97.4	27.05	50	0.343	0.157
31016	942	2.005	25.342	-97.42	27.033	114	0.353	0.787
31016	951	2.003	25.251	-97.42	27.033	113	0.353	0.777
31016	951	2.003	25.251	-97.42	27.033	113	0.353	0.777
31016	1000	1.999	25.002	-97.42	27.033	114	0.35	0.79
31016	1000	1.999	25.002	-97.42	27.033	114	0.35	0.79
31016	1000	1.999	25.002	-97.42	27.033	114	0.35	0.79
31016	1000	1.999	25.002	-97.42	27.033	114	0.35	0.79
31016	1009	2	24.752	-97.41	27.033	115	0.35	0.8
31016	1009	2	24.752	-97.41	27.033	115	0.35	0.8
31016	1009	2	24.752	-97.41	27.033	115	0.35	0.8
31016	1009	2	24.752	-97.41	27.033	115	0.35	0.8
31008	1500	1.998	24.501	-97.41	27.033	98	0.355	0.625
31008	1500	1.998	24.501	-97.41	27.033	98	0.347	0.633
31008	1500	1.998	24.501	-97.41	27.033	98	0.347	0.633
31008	1500	1.998	24.501	-97.41	27.033	98	0.347	0.633
31008	1355	2.003	24.253	-97.4	27.033	84	0.361	0.479
31008	1405	2.005	24.172	-97.4	27.033	74	0.355	0.385
31008	1425	1.999	24.131	-97.4	27.033	71	0.355	0.355
31008	1445	2	24.122	-97.4	27.033	69	0.355	0.335
31008	1435	2.001	24.113	-97.4	27.033	68	0.355	0.325
31008	1415	2.003	24.093	-97.4	27.033	60	0.355	0.245
31008	1245	1.001	25.336	-97.42	27.017	94	0.357	0.583
31008	1235	1.003	25.256	-97.42	27.017	96	0.357	0.603
31008	1235	1.003	25.256	-97.42	27.017	96	0.357	0.603
31008	1235	1.003	25.256	-97.42	27.017	96	0.357	0.603
31008	1235	1.003	25.256	-97.42	27.017	96	0.357	0.603
31008	1225	1.004	25.005	-97.42	27.017	95	0.357	0.593
31008	1225	1.004	25.005	-97.42	27.017	95	0.357	0.593
31008	1215	1.005	24.752	-97.41	27.017	92	0.357	0.563
31008	1215	1.005	24.752	-97.41	27.017	92	0.357	0.563
31008	1255	1.001	24.502	-97.41	27.017	88	0.357	0.523
31008	1315	1.004	24.333	-97.41	27.017	78	0.361	0.419
31008	1335	1.003	24.311	-97.41	27.017	71	0.361	0.349
31008	1345	1.001	24.299	-97.4	27.017	59	0.361	0.229
31008	1325	1.006	24.295	-97.4	27.017	68	0.361	0.319
31008	1305	1.003	24.253	-97.4	27.017	63	0.361	0.269
31013	930	0.004	25.32	-97.42	27	89	0.4	0.49
31013	1030	0.001	25.32	-97.42	27	89	0.397	0.493
31013	945	-0.001	25.28	-97.42	27	89	0.4	0.49
31013	1000	0.001	25.272	-97.42	27	95	0.397	0.553
31013	915	-0.002	25.255	-97.42	27	92	0.4	0.52
31013	1015	0.003	25.243	-97.42	27	90	0.397	0.503
31013	900	0.001	24.998	-97.42	27	89	0.4	0.49
31013	1045	0.003	24.751	-97.41	27	82	0.397	0.423
31013	1100	0.004	24.5	-97.41	27	77	0.396	0.374
31013	1115	0.005	24.255	-97.4	27	55	0.396	0.154
31016	924	-0.996	25.312	-97.42	26.983	66	0.353	0.307

31016	915	-0.999	25.253	-97.42	26.983	65	0.353	0.297
31013	1200	-0.996	25.003	-97.42	26.983	59	0.396	0.194
31016	912	-0.999	25.001	-97.42	26.983	61	0.353	0.257
31013	1145	-0.998	24.753	-97.41	26.983	48	0.396	0.084
31013	1130	-0.989	24.501	-97.41	26.984	39	0.396	-0.006
31016	933	-1.25	25.256	-97.42	26.979	54	0.353	0.187

46

PADRE ISLAND NATIONAL SEASHORE SEAGRASS SURVEY, 24 OCTOBER 2006, TO ESTIMATE

61024	1235	21.805	22.1	197	34.2	162.8
61024	1240.4	21.721	22.113	195	34.2	160.8
61024	1245.9	21.711	22.091	191	34.2	156.8
61024	1251.3	21.706	22.072	191	34.2	156.8
61024	1256.7	21.697	22.053	187	34.2	152.8
61024	1302.1	21.691	22.034	184	33.4	150.6
61024	1307.5	21.686	22.013	180	33.4	146.6
61024	1313	21.679	21.992	175	33.4	141.6
61024	1318.4	22.191	22.012	202	33.4	168.6
61024	1323.8	22.231	22.134	212	33.4	178.6
61024	1329.2	22.222	22.113	210	33.4	176.6
61024	1334.7	22.215	22.089	206	33.4	172.6
61024	1340.1	22.208	22.072	205	33.4	171.6
61024	1345.5	22.201	22.053	203	33.4	169.6
61024	1351	22.194	22.03	202	33.4	168.6
61024	1356.4	22.108	21.961	197	33.4	163.6
61024	1401.8	22.079	21.881	192	32.8	159.2
61024	1407.2	22.051	21.8	185	32.8	152.2
61024	1412.7	22.063	21.748	178	32.8	145.2
61024	1418.1	22.058	21.736	180	32.8	147.2
61024	1423.5	22.052	21.731	175	32.8	142.2
61024	1428.9	22.05	21.724	174	32.8	141.2
61024	1434.4	22.045	21.713	148	32.8	115.2
61024	1439.8	21.801	21.963	184	32.8	151.2
61024	1445.2	21.8	21.951	184	32.8	151.2
61024	1450.7	21.813	21.923	179	32.8	146.2
61024	1456.1	21.816	21.931	180	32.8	147.2
61024	1501.5	21.818	21.942	185	32.3	152.7
61024	1506.9	21.668	21.953	174	32.3	141.7
61024	1512.4	21.65	21.912	162	32.3	129.7
61024	1517.8	21.662	21.933	174	32.3	141.7
61024	1523	21.658	21.924	174	32.3	141.7

DOM	SUB	ANCHOR	EDGE	EDGE SHOOT PLANT	DENSITY HT (CM)	NOTES
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2Hw, 2B		Hw	Hw/B	D		167S, 190B
4B		B				ABANDONED CHA
4Hw			Hw/B	S		RUPPIA IN ARE
			TV			
			TV			
3Hw, 1B				S		AREA IS MOSTL
4B		B				ACCUMULATIONS
2Hw, 2B		Hw				
4B		B				DEAD
4B		B				SOFT WITH DEA
1Hw, 1B		Hw	Hw/B			DEAD LAYER ON
4Hw		Hw				BUNCH OF DEAD
3Hw, 1B		Hw				DEAD LAYER ON
					31	10.7
4Hw	2C	Hw, C			44	13.2
					27	11.7
					29	11.8
1Hw, 3B		Hw				
1Hw, 3B		Hw	Hw/B	S		
4B		B				
4B		B				
4B		B				ALGAL MAT
4B		B	TV			
		B				ANCHOR AT 18.
4Hw		Hw	Hw/B	S		
4B						
4B						
			WL			
			TV			
			TV			
4B		B				
4B		B				
4B		B				
4B		B				
4B		B				
1Hw, 3B		B				
4B		B				
1Hw, 3B		B	Hw/B	S		
2Hw, 2B		Hw				
4Hw		Hw			11	19.4
					23	25.1
					9	24.6
					26	25
					17	8.7
4Hw	3C	Hw, C			24	9.3
					31	7.8
					18	11.3
					28	11.6
					31	14.9
					22	12.5
					29	11.6
4Hw	2C	Hw				
2Hw, 2B	1C	B				
2Hw, 2B		B				
2Hw, 2B	1C	Hw	Hw/B	S		

4B	B			
4B	B			
		WL, TV		
	Hw			ANCHOR WITH H
	Hw	Hw/B		
4Hw	Hw			27 30.5 MANY Hw SEEDS
				24 24
				42 24.2
				28 23.8
4Hw	Hw			20 10
				31 10.6
				23 12.2
				25 10
				37 10.6
				27 12.2
4Hw	Hw			26 11
				31 10.6
				8 16.8
4Hw	Hw			28 14.5
				32 11.7
				24 18.4
4Hw	Hw			
4Hw	B			
4Hw	Hw	HW/B	S	
4B	B			
		TV		
	B			ANCHOR AT 19.
4Hw	Hw	Hw/B		
4Hw		Hw/B	S	
		WL		
		TV		
		TV		
		WL		
4Hw		Hw/B	S	
				29 20.3
4Hw	Hw			25 25.1
				23 23
				9 24.1
				24 19.8
				12 16.5
				24 21.9
4Hw	Hw			27 22
4Hw	Hw	Hw/B	S	
4B	B			
4B				
4B				
4B				
4B				
4B				
4B				
4B				
		WL		
		TV		
4B	B			188S, 174B
1Hw, 3B	B	Hw/B	D	162S, 166B
4B	B			

1HW, 3B	B			1 SHOOT
4B	B			
1HW, 3B	Hw			1 SHOOT
4B	B			
1HW, 3B	B			1 SHOOT
1HW, 3B	B			4 SHOTS
3HW, 1B				
			0	
1HW, 3B	Hw		0	14.5
			0	11.8
			0	
			18	
			12	
			15	
4Hw	Hw		17	
			12*	22 * COUNTS ON W
			4*	21.8 * COUNTS ON W
4Hw	Hw		19*	21.9 * COUNTS ON W
			16*	22.9 * COUNTS ON W
4Hw	B	Hw/B		117S, 112B
4B	B			
4B				
4B				
4B				
4B				
		WL		
		TV		
				CORNER OF PAR
				dep 130 at an
4B	Hw			
4Hw	Hw			
4B	B			
4B	B			
4B	B			
4B	B			
4Hw	Hw	Hw/B		D
4Hw	Hw			
4Hw	Hw			
4B	B			
4B	B			
4B	B			
4B	B			
3Hw, 1B	Hw, He	Hw/B		D
3Hw, 1B	Hw			
4B	B			
1Hw, 3B	B	Hw/B		D
4B	B			
4B	B			
4B	B			
4B	Hw	Hw/B		D
4Hw	Hw			
4B	B			
				200S, 180B
				GIWW edge
4B	B			
4B	B			
4B	B			
4B	B			
2Hw, 2B	Hw, L	Hw/B		D
			17	14
			19*	13.8 * COUNTS ON W

[illegible]

4Hw						
4Hw	Hw					
4Hw	Hw	Hw/B	D			
4B	B					
4B	B					
4B	B					
4B	B					
4B	B					
3Hw, 1B	B	Hw/B	D			
3Hw, 1B	B					
4Hw	Hw					
				18	17.5	
				22	20	
				23	22.6	
				16	22.7	
4Hw	Hw					
4Hw	Hw	Hw/B	D			
4B	B					
4B	B					
4B	B					
4B	B					
4Hw	Hw					
4Hw	Hw					
1Hw, 3B	Hw, L	Hw/B				165S, 113B
4Hw	Hw			10	14.2	
				9	21.8	
				16	25.7	
				14	20	
				22	21.6	
				21	20.8	
4Hw	Hw			15	18.3	
				2	25	
				21	17.7	
				24	23.6	
				19	21.9	
4Hw	Hw			17	24.5	
				18	17.5	
				21	21.1	
4Hw	Hw			14	21.8	
				16	22.5	
				26	19.3	
				24	20	
				15	20.8	
				22	19.5	
4Hw	Hw					
4Hw	Hw					
4B	Hw	Hw/B	S			
4B	B					35S, 30B
2Hw, 2B	Hw					sparse
4Hw	Hw					
4Hw	B					
						no sample
4Hw	Hw					
4B	B					>200S, 116B
4Hw	Hw	Hw/B	S			
4Hw	B					
				20	24	
4Hw	Hw			24	18.2	
				12	24.7	
				13	17.3	

				11	10.6	
4Hw	Hw			17	20	
				4	11.3	
				8	10.4	
4Hw	Hw			11	25.3	
				8	18.7	
				9	14	
				13	22.6	
				9	17.7	
				5	22.3	
4Hw	Hw			15	14.6	
				12	20.9	
				12	19.2	
4Hw	Hw			14	17.8	
				14	21.8	
				9	19.8	
3Hw, 1B	B	Hw/B	S			129S, 115B
4B	B					
3Hw, 1B	Hw					
4Hw	Hw					
3Hw, 1B	Hw	Hw/B	D			
3Hw, 1Sf	Hw					
4B	B					
4B	B					
4Hw	Hw					
3Hw, 1B	Hw					
4B	B					
4Hw	Hw, L					
4B	Hw	Hw/B	D			
4B	B					
4Hw	Hw	Hw/B	D			
4B	B					
4B	B					
4B	B					
4B	B					
3Hw, 1B	B					
2Hw, 2B						
4B						
4B						
4B						
4B						
4B						
4B						
4B						
4B						
4B						
4B						
4B						
4B						
4B						
4B						
4B						
4Hw						TV
1Hw, 1He, 2B						
4B						
4B						
4B						no anc, walkin

4Hw						
2Hw, 2B	Hw					
4B	B					182S, 159B
4B	B					
4B	B					
4B	B					
3Hw, 1B	Hw	Hw/B		S		
4Hw	Hw					
1Hw, 3B	B					
4B	B					
2Hw, 2B	Hw					
4Hw	B					
2Hw, 2B	Hw					
4Hw	Hw					
3Hw, 1B	B	Hw/B		D		
4B	B					
4B	B					
4B	B					
4B	B					
4B	B					
4B	B					
4B	B					
1Hw, 3B	B					125S, 119B
4B	B					29S, 18B
4Hw						
4Hw	Hw, He					
4B	B					
4B	B					161S, 155B
4B	B					
4B	B					
4B	B					
4B	B					
4B	B					
4B	B					
3Hw, 1B	Hw	Hw/B		D		
1Hw, 3B	B				7 19.5	
4Hw	Hw	Hw/B		S		90S, 78B
4B	B					
4B	B					
4B	B					
4B	B					
2Hw, 2B	Hw	Hw/B		D		
3Hw, 1B	Hw					
3Hw, 1B		Hw/B		S		
4B						
4B						
						tv
4B	B					
4B	B					
4B	B					
4B	B					
4Hw		Hw/B		S		
4B						
4B						
						tv
4B	B					
4B	B					

4B		B			
1Hw, 3B		B	Hw/B	D	
1Hw, 3B		B	Hw/B	S	
4B		B			
4B		B			90S, 80B
4B		B			
4B					
4B					
4B					
4B					
					tv
4B		B			>200S, 155B
4B		Hw			129S, 135B, 109
4B		B			
4B		B			
4B		Hw			139S, 133B
2Hw, 2B		Hw			115S, 140B
4Hw		Hw			
				19	17.4 55S, 44B
				12	16.8 55S, 44B
				14	18.3 55S, 44B
				22	11.3 55S, 44B
4Hw		Hw			
4Hw		Hw, L			
4Hw	1L	Hw			
4Hw		B			
4B		B, L			
4B		Hw	Hw/B	D	133S, 125B
4B		B			
4B		B			
4B		B			
4B		B			
4B		B			
4B		B			75S, 71B
1Hw, 3B		B			45S, 51B
4Hw		Hw			
4B					
4B					
2Hw, 2B					
4B					
3Hw, 1B					
4B					
4B					
4B					
4B		B			
4B		Hw			dep 90 at anc
4Hw		B			
4B		B			
4B		B			
4B		B			
4B		B			
4B		Hw	Hw/B	D	130S, 125B, 120
1Hw, 3B		Hw			122S, 118B
4Hw					
4Hw			Hw/B	S	
4B					
4B					
4B					
4B		B			170S, 163B

4B		B				
3Hw, 1B		Hw	Hw/B	D		
4Hw		Hw				
4Hw		B				
4B		B				
4B		B				
4B		B				
4Hw		Hw	Hw/B	D		
1Hw, 3B						
4Hw						walking south
3Hw, 1B						
3Hw, 1B						
4Hw						
1Hw, 3B						
2Hw, 2B						
3Hw, 1B						
4Hw						
1Hw, 3B						
2Hw, 2B						
1Hw, 3B						
4B						
4B						
4B						
4B						
2Hw, 2Rm	2Hw, 1Rm					
3Hw, 1B						
3Hw, 1Rm	1Hw					
4Hw	3Rm					
3Rm, 1Hw	3Hw, 1Rm					
2Hw, 2Rm	2Hw, 2Rm					
1Rm, 3B						
4B						
2Rm, 2B						
1Rm, 3B						
1Rm, 3B						
4B						
4B						
4Hw						
4B						
1Hw, 3B						
4Hw						
4B						
4Hw						
NO SAMPLE		B				200S, 165B
4Hw		B	Hw/B			
					48	19.2
					43	17.7
4Hw		Hw			76	23.5
					38	18.5
4Hw	1C	Hw	Hw/B	S		
4B		B				
4B		B				
4B		B				
4B		B				
4B		B				
1HW, 3B		Hw	Hw/B	S		GERMINATING H
3Hw, 1B	1C	Hw				1 SHOOT
					43	13.4

4Hw		Hw		51	9.6
				52	11.4
				43	10
4Hw	2C	Hw			
4Hw	2C	Hw			
4B		B			
4B		B			
4Hw					
4B		B			
4Hw	3Rm				
4Hw					
4B					
4B					
4Hw					
2Hw, 2Rm	2Rm				
4Hw					
4Hw	1Rm				
1Hw, 3B					
1Hw, 3B					
4B					
1Rm, 3B					
4Rm					
4Rm					
4Rm					
3Rm, 1B			Srm		
4B					
4B					
4B					
4B					
4B					
4B					
4B					
			PINS BOUNDARY		
				33	7.7
4Hw	3C	Hw		31	9.5
				6	8.6
				29	8
				17	11.3
				28	12.2
				34	12
				37	10.8
4Hw		Hw			
4Hw	1C	Hw			
4Hw		Hw			
2Hw, 2B		B	Hw/B	S	
4B		B			
4B		B			
4Hw		Hw			
4Hw		Hw			
4Hw		B			
4Hw		Hw			
4Hw		Hw			
4Hw		Hw			
4Hw					
4Hw					
4Hw					
1Hw, 3B			Hw/B	S	
4B					
4B					

4B		B							
4B		B							
4B		B							
4B		B							
4B		B							
4B		B							
3Hw, 1B		B	Hw/B	S					
4B		Hw							
						0			
1Hw, 3B	C	B				0			
						0			
						7	3.8		
1Hw, 3B		B	Hw/B	S				2	SHOOTS
4B		B							
4B		B							
4B		B							
			WL, TV						
4Hw	3He	Hw, He							
1Hw, 3B		He	Hw/B	S					
4B		B							
4B		B							
4B		B							
4B		B							
4B		B							
4B		B							
4B		B							
1Hw, 3B		He	Hw/B	D					
2He, 2B	Hw	Hw, He							SEDIMENT NOT
2Hw, 2B		Hw							BARES ARE REC
4Hw									
1Hw, 3B									
4B									
1Hw, 3B									
4B									
4B									
4B									
4B									
4B									
4B		B							
4B		B							
4B		B							
4Hw		Hw	Hw/B	D					
3Hw, 1B		Hw							
4Hw	1C	Hw							
						39	13		
4Hw		Hw				34	15.6		
						27	14.2		
						42	15.7		
3Hw, 1B		B	Hw/B	S					
4B		B							
4B		B							
4B		B							
4B		B							SPARSE
4Hw		Hw							
4Hw		Hw				12	7.5		
						35	8.5		
						24	8.7		

					14	7.9	
3Hw, 1B		B	Hw/B	S			
4B		B					
4B		B					
4B		B					
4B		B					
4Hw							
3Hw, 1B							
4B							tv,salicornia
4Hw		Hw					
4Hw			Hw/B	S			
4B							
1Hw, 3B							
3C, 1B							
4B		B					
4B							
4B							
4B							
4B							DEAD LAYER ON
4B		B					
2HW, 2B		B	Hw/B	S			
4Hw	2C	B, D					
4Hw	2C	Hw			27	9.5	
					33	8.5	
					31	8	
					39	7.8	
4B		Hw					
2Hw, 2B		B	Hw/B	S			
4B		B					
4B		B					
4B		B					
4B							soft sludge
4B		B					soft sludge
4Hw							
4Hw		Hw	PINS BOUNDARY				
					38	18.4	
					32	19.3	
					22	20	
4Hw		Hw			34	18.7	
4Hw		Hw			45	16.5	
					42	14.5	
					51	14.8	
					29	16.5	
					31	9.3	
4Hw	2C	Hw			44	10.3	
					36	10.4	
					31	9.8	
4Hw	2C	Hw					
4Hw		Hw					
1Hw, 3B		B	Hw/B	S			
4B		B					
4B		B					
			PINS BOUNDARY?				ORANGE CONE S
4B		B					DEAD RHIZOME
4B		B					DEAD RHIZOME
4B		B					DEAD RHIZOME
2Hw, 2B		Hw	Hw/B	D			
4B		Hw					DEAD RHIZOME,

[illegible]

4B							
4B							
2Hw, 2B							
4B							
4B							
4Hw			Hw/B	S			
4Hw							
4B		B					
4B		B					
4B		Hw	Hw/B	D			
4Hw		Hw					
4Hw		Hw					
4Hw		Hw					
4Hw		Hw					
4Hw		Hw					
4Hw		B					sparse
1Hw, 3B			Hw/B	S			1shoot
4B							
4B							
4B		B					no sample
4B		B					
4B		B					
2Hw, 2B		Hw	Hw/B	D			126S, 110B
3Hw, 1B		Hw					
4Hw		Hw					
4Hw		Hw					
4Hw		Hw					
4Hw		Hw					
4Hw	2Rm						
4Hw			Hw/B	S			
4B							
4B							
3Hw, 1B		Hw, C					
						17	12.3
						19	12.1
4Hw		Hw				11	10.6
						44	9.3
1Hw, 2C, 1B		Hw, C					
3C, 1B		Hw	Hw/B	S			
2C, 2B		B					
2C, 2B		C					
4B		B					
3C, 1B		B					
4B							
4B		B					
4B		B					
4B		B					
1Hw, 3B		Hw					
4B		Hw					channel, soft
2Hw, 2B		B	Hw/B	S			
4B		C					
4Hw		Hw					
4Hw		Hw				22	15.1
						36	12.4
						35	11
						46	11.8
4Hw		Hw					

2Hw, 1C, 1B		B	Hw/B	S	
4B		B			
1C, 3B		B			
4B		B			
					NEED TO LOOK
4Hw		Hw			
4Hw	2Rm	Hw, Rm			
2Hw, 2B			Hw/B	S	
4B					
4B		B			
1Hw, 3B		Hw			2 shoots
1Hw, 3B		B			1 seedling, se
1Hw, 3B		Hw	Hw/B	S	1shoot
4B		B			
4B		B			
4Hw		Hw	Hw/B	S	
4B		B			
4B		B			
4B					
4B					
4B					
1Rm, 3B			Rm/B	D	
1Rm, 3B	1ac				
3Rm, 1B					
2Rm, 2B					
3Rm, 1B					
4Rm	1ac				
4Rm					
4Rm					
4Rm	1ac		Rm/B	S	
4B					
4B					
4B					
4B					
4B					
4B					
4B					
4B					emergent
4B					emergent
					narrow Hw ban
4B					soft, sludge
2Rm, 2B				Srm	
2Rm, 2B					
4B		B			PINS boundary
2Rm, 2B					
2Rm, 2B	1ac				
3Rm, 1B				Srm	
4B					
4B					
4B		B			
4B					
4B					
4B		B			
4B					
4B		B			
2Rm, 2B		B			

1Hw, 3B	B		1	0.2 seedling
4B				
4Rm				
3Rm, 1B				
1Rm, 3B		Srm		seedling
4B				
4B	B			
4B				
4B				
4B				emergent
			0	
1Hw, 3B	B		0	
			1	3 seedlings
			0	
4B				emergent
4B				
4Hw				
4B				soft, channel
3Hw, 1B	B			SMALL, SPARSE
4Hw				SMALL, SPARSE
3Hw, 1C			1	0.7 seedlings
			1	0.3 seedlings
4Hw	B		3	0.7 seedlings
			2	1 seedlings
			1	2
			0	
3Hw, 1B			4	2.1
			1	2
4Hw				
4Hw				
1Hw, 3B	B			2 seedlings,
1Hw, 3B	B			1 seedling, 1
2Hw, 2B	B			3 seedlings,
3Hw, 1B	B			7 seedlings,
1Hw, 3B	B	Hw/B	S	1 seedling, 0
4B	B			
4B	B			
4B	B			
4B	B			
4B	B			
4B	B			
				PINS boundary
4Hw		4Rm		at PINS bound
4Hw		4Rm, 1ac		
4B				
4Hw		2Rm		
2Hw, 2B				
4Hw				
3Hw, 1B				
4Hw				
4Hw				
4Hw				
3Hw, 1B		Hw/B	S	
4B				
4B				
4B				
4B				

2Hw, 2B							
4Hw	4Rm						
4Hw		Hw					
4Hw		Hw					
4Hw		Hw					
4Hw		Hw					
4Hw		B					
4Hw		Hw					
3Hw, 1B		Hw					
4Hw		B					
1Hw, 3B		B	Hw/B	S			
4B		B					
4B		B					
1Hw, 3B		B	PINS				
3Hw, 1B		Rm?			1	2	
					1	2	
					0		
					1	1	
2Hw, 2B		Hw					3 seedlings,
1Hw, 3B		B	Hw/B	S			1 seedling, 1
4B		B					
4B		B					
4B		B					
4B		B					
4B		B					
4B		B					few black see
3Hw, 1C	1C	Hw					
3Hw, 1B	1C	B			11	13.1	
					9	12.6	
					11	9	
					18	14.7	
					24	13.7	
					29	16.5	
4Hw	3C	Hw			3	4.4	
					14	16.7	
					19	12.6	
					14	15.4	
4Hw		Hw			12	12.6	Rm in area
1Hw, 3B		B			11	6.8	
1Hw, 3B		B					1 seedling, 1
4B		Hw					
4B		B					
4B		B					
4B		B					
4Hw		Hw					
					7	14.2	
					29	14.4	full core
4Hw		Hw			5	12.2	
					10	11.1	
					1	9	
2Hw, 2B		Hw			9	9	
4Hw		Hw			8	17	
					19	15.2	
					22	15.6	
					21	12	
2Hw, 2B		Hw					
1Hw, 1C, 2B		B	Hw/B				

4B	B			
4B	C			
4B	B			
4B	B			
4B	C			
4B	B			
1Hw, 1C, 2B	B	Hw/B		1 shoot
			28	17.2
			14	18.4
4Hw	Hw		21	25
			22	18.6
			2	3.5 full core
2Hw, 2B	B		1	2 full core
3Hw, 1B	B			sparse seedli
1Hw, 3B	B			seedling
2Hw, 2B	B			seedlings
4B	B			
2Hw, 2B	B	Hw/B	S	sparse seedli
4B	B			
4B	B			
4B	B			
1Hw, 3B	B			
			3	4.3 full core
			14	10
			3	6.7 full core
4Hw	Hw		12	8.9 tips of blade
1Hw, 3B	Hw		4	4.1 full core
1Hw, 3B	Hw	Hw/B		
4B	B			
4B	B			
4B	B			
4B	B			
4B	B			
4B	B			
4B	B			
4B	B			
1Hw, 3B	B			
1Hw, 3B	Hw			
3Hw, 1B	Hw (mostly dead)		8	27.5 all
			34	31 all
			16	28.8 tips dead - g
3Hw, 1B	Hw			
1Hw, 3B	Hw			
1Hw, 3B	Hw	Hw/B		
4B	He			2 He shoots o
4B	L			
4B	B			
4B	B			
4B	B			
4B	Hw			
2Hw, 2B	B			
4Hw	Hw			
4Hw	Hw			
4Hw	Hw			
4Hw	Hw			
			22	16.6
4Hw	Hw		10	13.2
			6	14.2

				24	18.6	
4Hw	Hw					
4Hw	Hw					
2Hw, 2B	Hw					
4B	B					
1Hw, 3B	B	Hw/B	S			1 seedling, 3
4B	B					
4B	B					
1He, 3B	B					
4B	B					2 He
1He, 3B	B					
4B	B					
4B	B					
4B	B					
1Hw, 3B	B	Hw/B				
2Hw, 2B	B					
4B	B					
1He, 3B	Hw					
2Hw, 1He, 1B	Hw					
1Hw, 3B	Hw					
4Hw	B					6 He
				14	14.1	
				2	14.6	
				2	7.9	
3Hw, 1He	B?					
2Hw, 2B	Hw					
4B	Hw					
1Hw, 3B	B					
1C, 3B	Hw					
4Hw	B					
4Hw	Hw					
4Hw	B					
1Hw, 3B	B		S			
4B	B					
4B	B					
4B	B					
4B	B					
4Hw	Hw					
				33	22.8	
4Hw	Hw			19	39.2	
				17	27.9	
				24	29	
				31	36.6	
				23	42.2	
4Hw	Hw			18	30.5	
				20	35	
				18	48.9	
				16	41.1	
				15	34.7	1 He
4Hw	Hw			21	30	
				16	30.4	
				14	28.5	
4Hw	Hw			27	28	
				22	32	
2Hw, 2B	Hw					
1Hw, 1He, 2B	Hw					
2Hw, 2B	B					
4B	B					

[illegible]

4B	B
4B	B

done 13Oct03

4B	B
4B	B
4B	B

CHANGES IN DEPTH AT OUTER EDGE 1988 TO 2006

L1

4B	B	
4B	B	
4B	B	
4B	B	
4B	B	
4B	no Anc	
4B	no Anc	
4Hw	Hw	Hw/B

4B	B	
4B	B	
1Hw, 3B	Hw	
2Hw, 2B	B	Hw/B
4B	B	

L2

depth 184S,17

4B	B	
3Hw, 1B	Hw	
4B	B	
1Hw, 3B	B	Hw/B

NNEL, CHECK MAP OR AERIAL PHOTO
A

Y BARE
OF DEAD WITH SPORADIC Hw AROUND

D LAYER ON TOP
[BARE
ON ANCHOR
[BARE

084, 57 CM DEEP WAS BARE

W LISTED SEPARATELY WITH COORDINATES FOR EDGE
: IN CORE

129 BARE

HOLE CORE (80 SQ CM)
HOLE CORE (80 SQ CM)
HOLE CORE (80 SQ CM)
HOLE CORE (80 SQ CM)

KING LOT
.C

HOLE CORE (80 SQ CM)

HOLE CORE (80 SQ CM)
HOLE CORE (80 SQ CM)
HOLE CORE (80 SQ CM)

02/16/05	1100	0.678
02/16/05	1000	0.684

02/16/05	1200	0.675
02/16/05	1300	0.672
02/16/05	1400	0.672
02/16/05	1600	0.671
02/16/05	1500	0.671

02/16/05	1700	0.672
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.g

02/16/05	2200	0.674
02/16/05	2100	0.67
02/16/05	2000	0.67
02/16/05	1900	0.673
02/16/05	1800	0.672

02/16/05	2300	0.678
03/01/05	0	0.828

02/16/05	900	0.689
02/16/05	800	0.693
03/17/05	1600	0.623

03/01/05	800	0.797
03/01/05	600	0.806
03/01/05	900	0.79
03/01/05	700	0.802
03/01/05	100	0.826
03/01/05	200	0.822
03/01/05	300	0.803
03/01/05	400	0.814
03/01/05	500	0.81
03/01/05	1400	0.767
03/01/05	1500	0.765
03/01/05	1600	0.762
03/01/05	1700	0.756
03/01/05	1300	0.771
03/01/05	1200	0.777
03/01/05	1100	0.782
03/01/05	1000	0.786
03/10/05	300	0.725
03/10/05	400	0.723

03/10/05	500	0.723
03/10/05	600	0.721
03/10/05	0	0.735
03/10/05	200	0.73
03/10/05	100	0.735
03/01/05	2300	0.743
03/01/05	2200	0.745
03/01/05	2100	0.746
03/01/05	2000	0.747
03/01/05	1900	0.753
03/01/05	1800	0.751

A

!

Anc

03/17/05	1400	0.617
03/17/05	700	0.665
03/17/05	800	0.66
03/17/05	900	0.649
03/17/05	1300	0.612
03/17/05	1200	0.623
03/17/05	1000	0.64
03/17/05	1100	0.63
03/17/05	500	0.69

03/17/05	600	0.672
03/17/05	400	0.704

03/17/05	1700	0.623
03/17/05	1500	0.615
03/10/05	700	0.717
03/10/05	800	0.715
03/10/05	900	0.712

03/17/05	0	0.722
03/17/05	100	0.72
03/17/05	300	0.712
03/17/05	200	0.72
03/10/05	2300	0.648
03/10/05	2200	0.65

w SEED

03/17/05	1800	0.623
03/17/05	1900	0.623
03/17/05	2000	0.629
03/17/05	2100	0.629
03/17/05	2200	0.632
03/17/05	2300	0.627
05/05/05	0	0.802
05/05/05	100	0.803
05/05/05	200	0.799
05/05/05	400	0.801
05/05/05	300	0.799
05/05/05	500	0.808

SO SOFT

ENT DEAD, SEDIMENT VERY SOFT

05/12/05	1100	0.702
05/12/05	1900	0.723
05/12/05	1800	0.723
05/12/05	1700	0.715
05/12/05	1600	0.711
05/12/05	1500	0.707
05/12/05	1400	0.702
05/12/05	1300	0.702
05/12/05	1200	0.7

05/12/05	2000	0.73
05/12/05	2100	0.726
05/12/05	2200	0.729

[TOP

05/12/05	2300	0.729
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LEASHORE MARKER - SEEMS OFF ACCORDING TO MAP

Hw IN AREA ON OTHER SIDE OF BOAT

.el
.el

05/05/05	1400	0.807
05/05/05	1300	0.813
05/05/05	1200	0.817
05/05/05	1100	0.822
05/05/05	1000	0.828
05/05/05	900	0.828
05/05/05	800	0.824
05/05/05	700	0.819
05/05/05	600	0.813
05/05/05	2200	0.779
05/05/05	2100	0.778
05/05/05	2000	0.781
05/05/05	1900	0.784
05/05/05	1800	0.785
05/05/05	1700	0.788
05/05/05	1600	0.793
05/05/05	1500	0.796
05/05/05	2300	0.776
05/12/05	0	0.729
05/12/05	100	0.729
05/12/05	200	0.721
05/12/05	300	0.721

05/12/05	400	0.721
05/12/05	500	0.712
05/12/05	600	0.71
05/12/05	700	0.71
05/12/05	800	0.707
05/12/05	900	0.701
05/12/05	1000	0.7
02/16/05	700	0.7
02/16/05	600	0.703
02/16/05	500	0.705
02/16/05	300	0.709
02/14/05	1900	0.768
02/14/05	2000	0.755
02/14/05	2100	0.755
02/14/05	2200	0.754
02/14/05	2300	0.748
02/16/05	0	0.704
02/16/05	100	0.707
02/16/05	200	0.707
02/16/05	400	0.707
02/14/05	1400	0.777
02/14/05	1500	0.772
02/14/05	1700	0.771
02/14/05	1800	0.766
02/14/05	1600	0.77

Bird Isl. PWL for PINSDIST.xls

05/24/05	1200	0.562
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., bare gunk

FARTHER EAST WHEN WATER IS UP TO RECONCILE WITH T9

	05/24/05	1600	0.569
	06/07/05	1300	0.675
	06/07/05	1600	0.698
	06/07/05	1500	0.693
	06/07/05	1400	0.683
	02/14/05	900	0.794
eds in area	02/14/05	1000	0.785
	02/14/05	1200	0.783
	02/14/05	1100	0.782
	02/14/05	1300	0.779
	05/24/05	1400	0.561
	05/24/05	1500	0.566
	05/24/05	1300	0.562

d

.

	08/04/05	1700	0.573
	08/04/05	1500	0.577
	08/04/05	1600	0.573
: PLANTS WITH SEED STILL ATTACHED			
: PLANTS WITH SEED STILL ATTACHED			

0.3 and 1.0 cm tall)
 cm
 2 at 0.5 cm, 1 at 0.3 cm
 5 at 0.3 cm, 1 at 0.2 cm, 1 at 1 cm
 .5 cm

marker	06/29/05	1300	0.767
lary marker	06/29/05	1200	0.771
	06/29/05	1100	0.773
	06/29/05	1400	0.765
	06/07/05	1700	0.702
	06/29/05	1500	0.764
	06/29/05	1600	0.758
	06/29/05	1700	0.755
	07/15/05	1000	0.69
	07/15/05	1100	0.693
	07/15/05	1200	0.698
	07/15/05	1300	0.7
	07/27/05	1400	0.669
	07/27/05	1500	0.664
	08/04/05	1400	0.57

07/27/05 1600 0.66
07/27/05 1700 0.652
Bird Island PWL for PINS work
2005

#	Time	013-pwl
02/14/05	0	0.822
02/14/05	100	0.823
02/14/05	200	0.821
02/14/05	300	0.82
02/14/05	400	0.812
02/14/05	500	0.814
02/14/05	700	0.804
02/14/05	800	0.796
02/14/05	600	0.808

2 at 1.0 cm, 1 at 0.7 cm
.0 cm

ds

. cm

ngs

ngs

s broken, stick epiphytes

razers on brown part

n anchor

cm

s, 2 cm

4B, Hw not at deep end

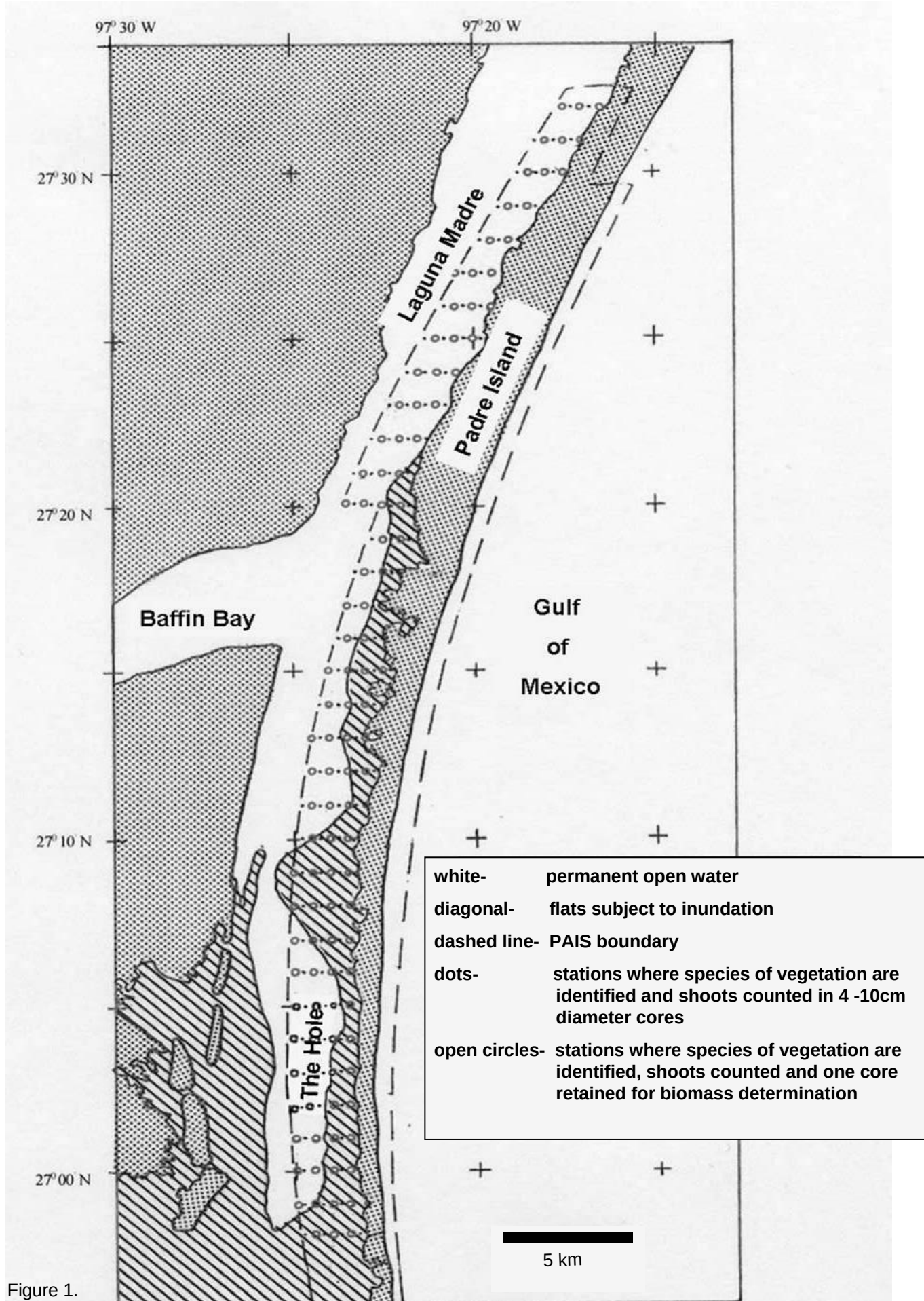


Figure 1.



Figure 2.

Minimum and maximum depth of seagrass occurrence

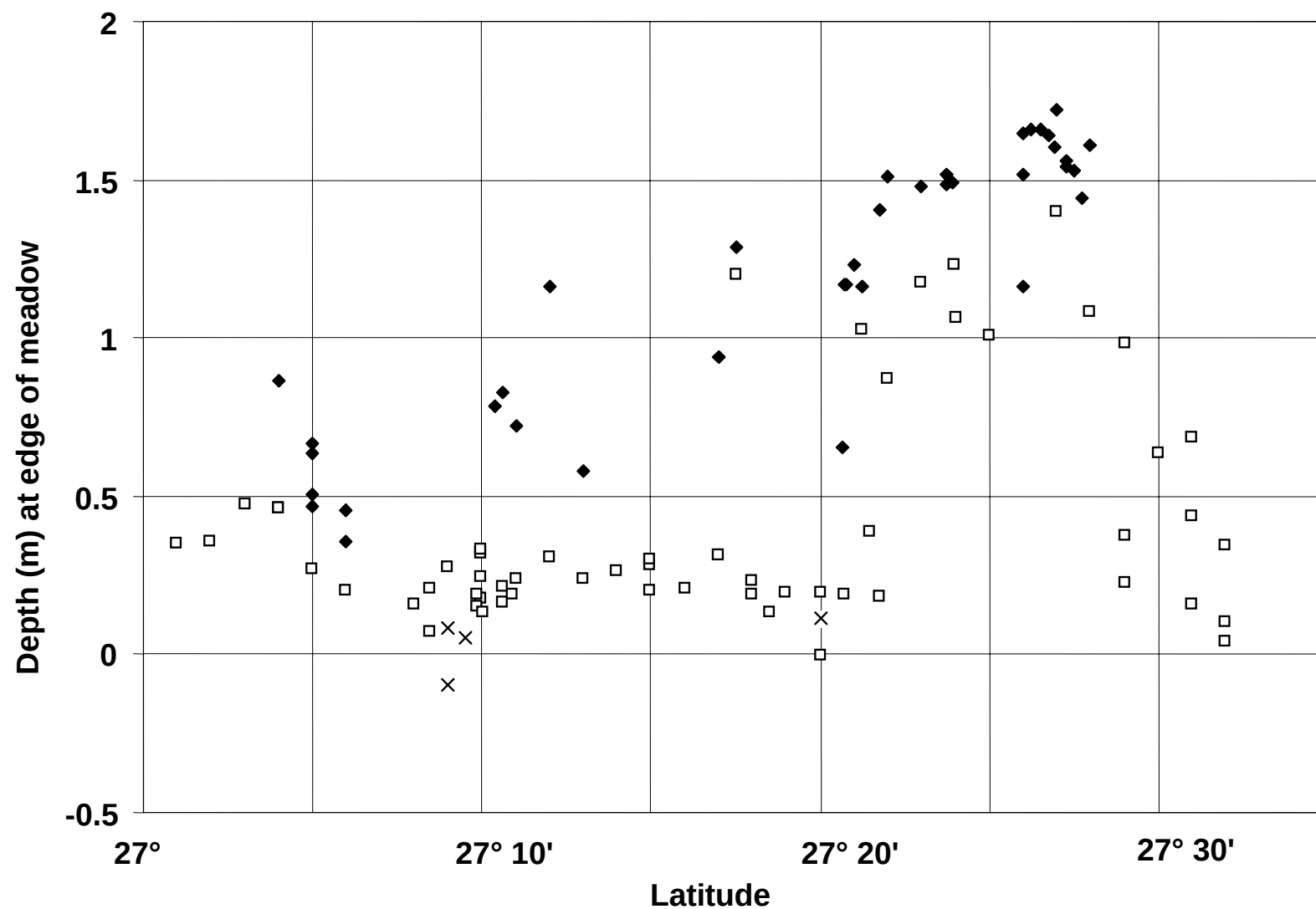


Figure 3.



Continuity of cover

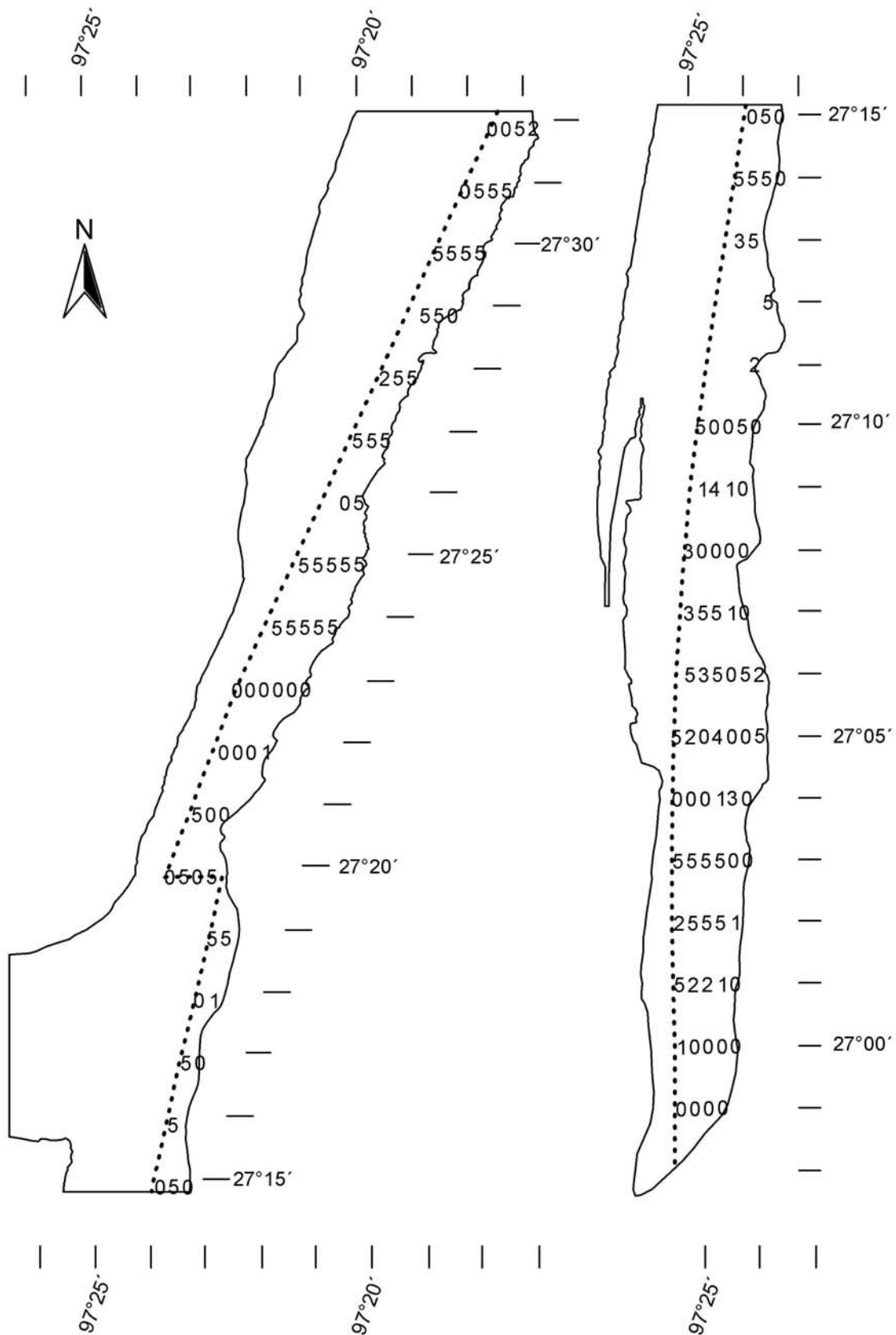


Figure 4.

Frequency of seagrass occurrence in different depth classes

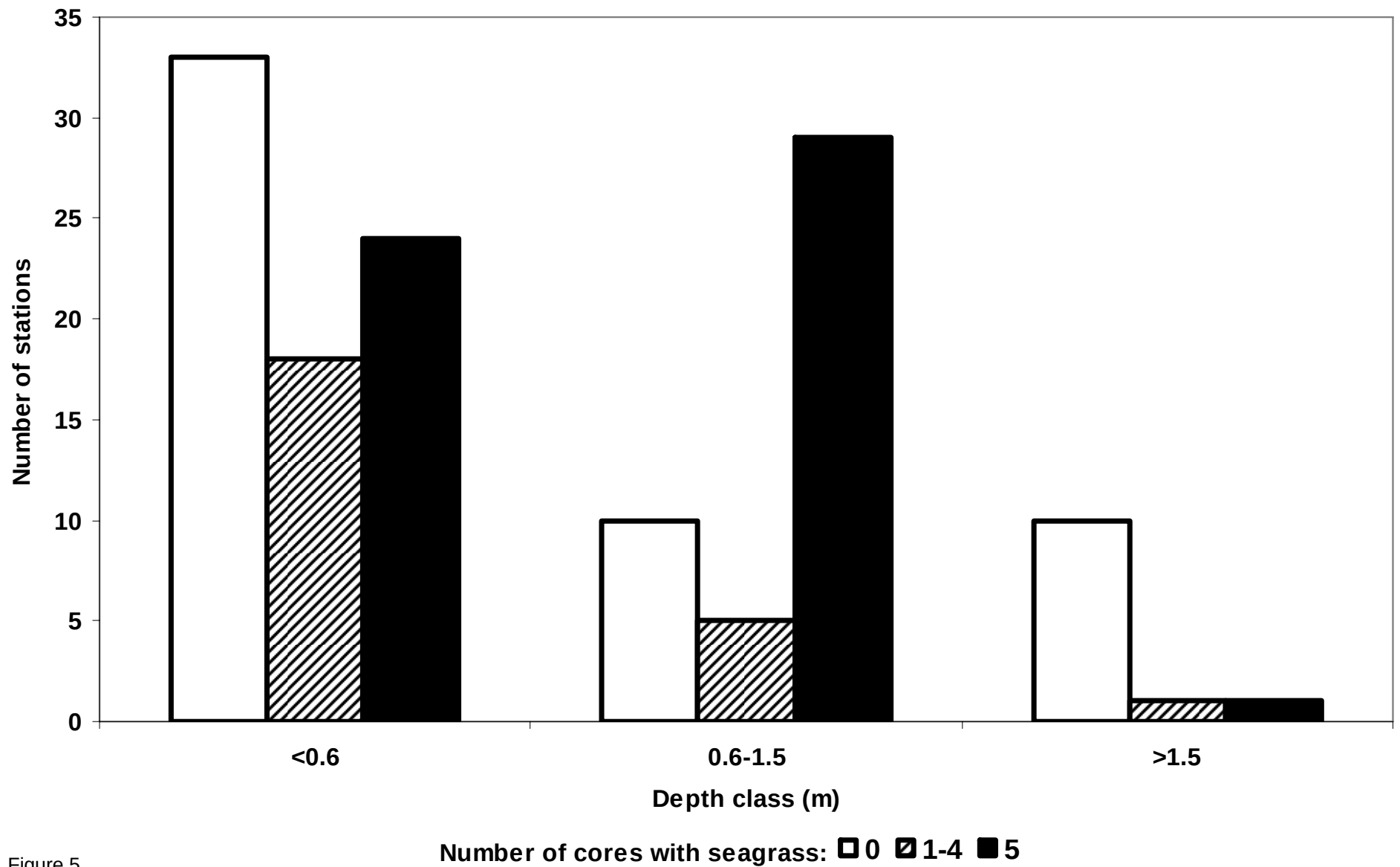


Figure 5.

Figure 6.

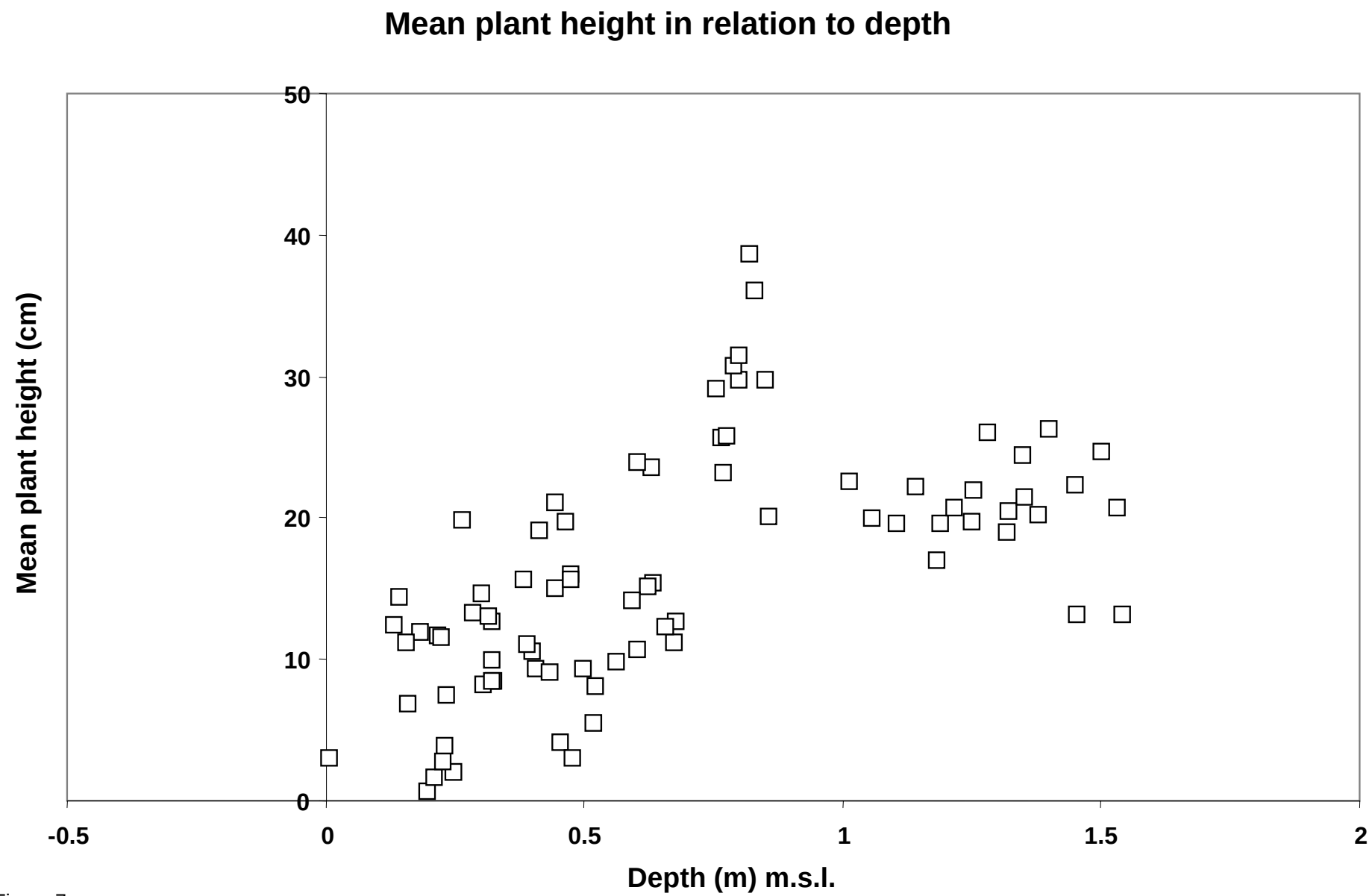


Figure 7.

Mean shoot density

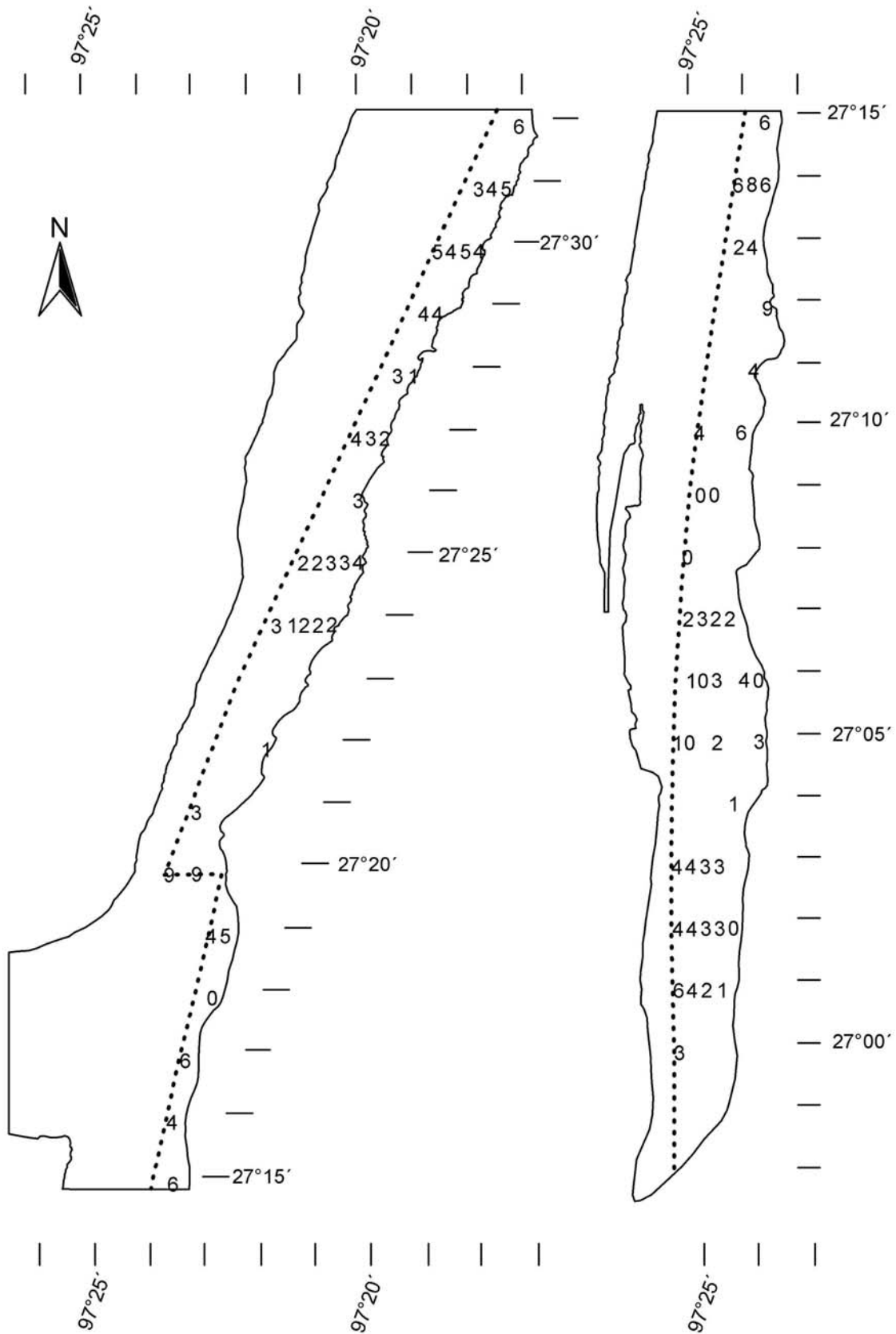


Figure 8.

Mean shoot density in relation to depth

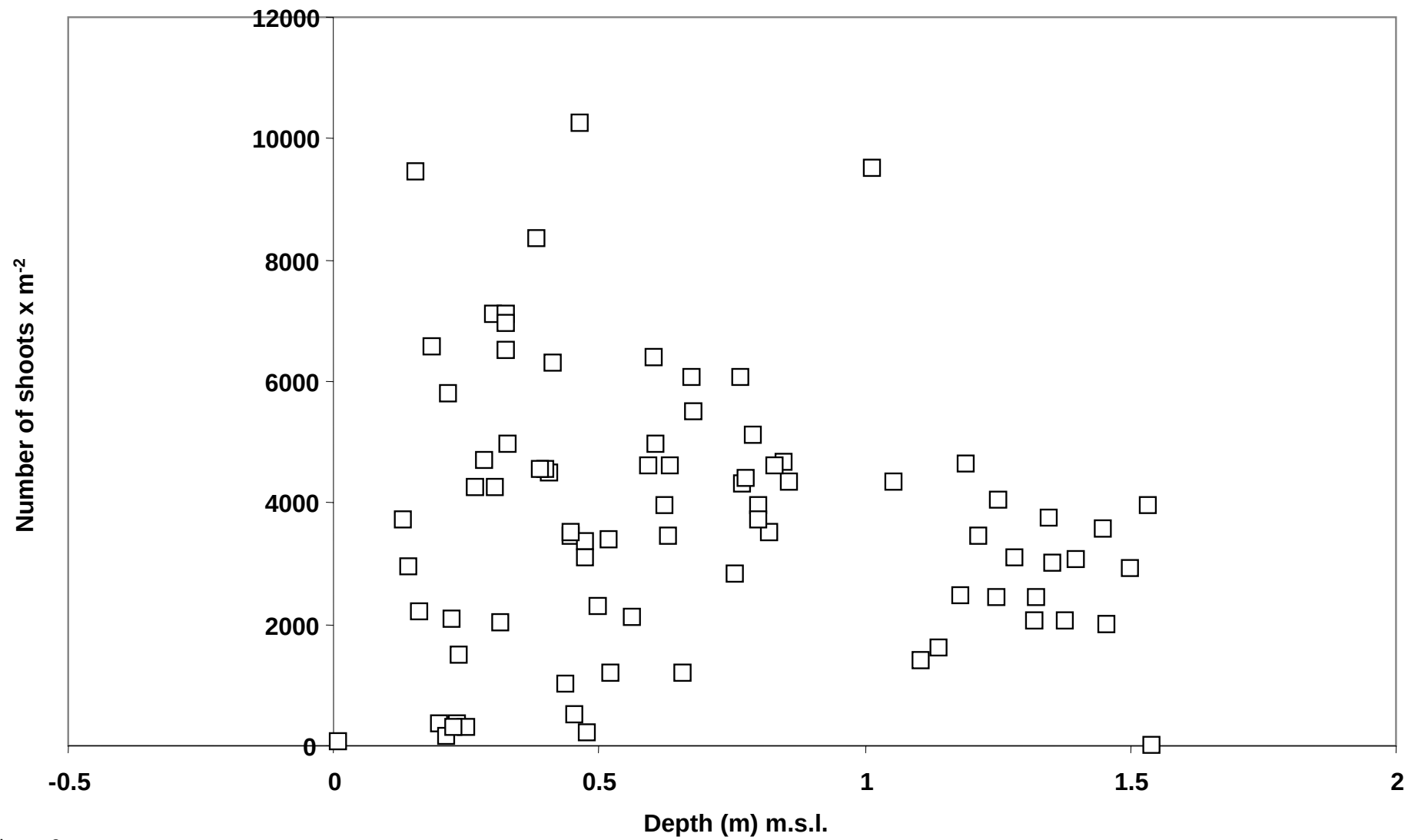
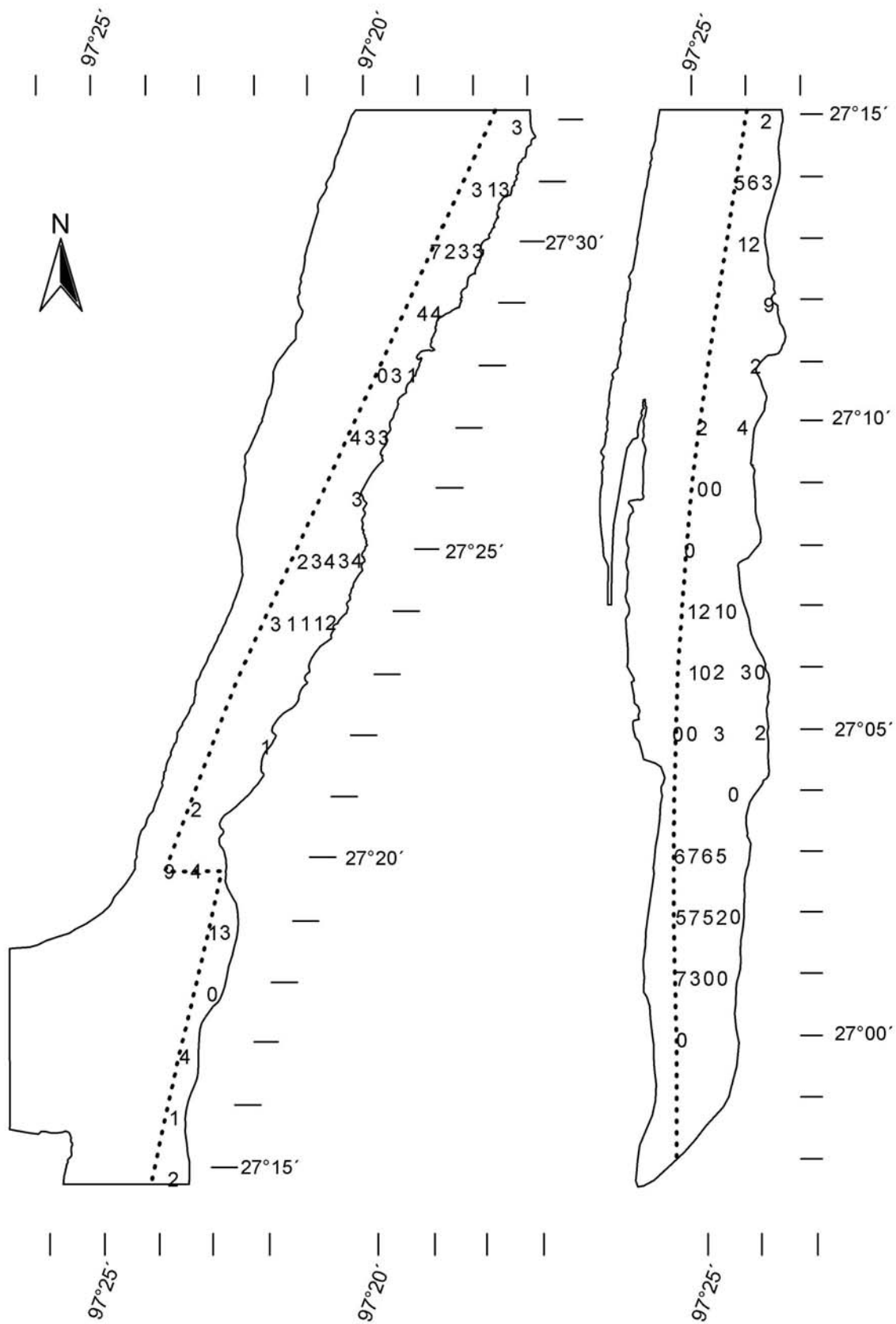


Figure 9.

Mean plant height x mean shoot density



Mean plant height x mean shoot density in relation to depth

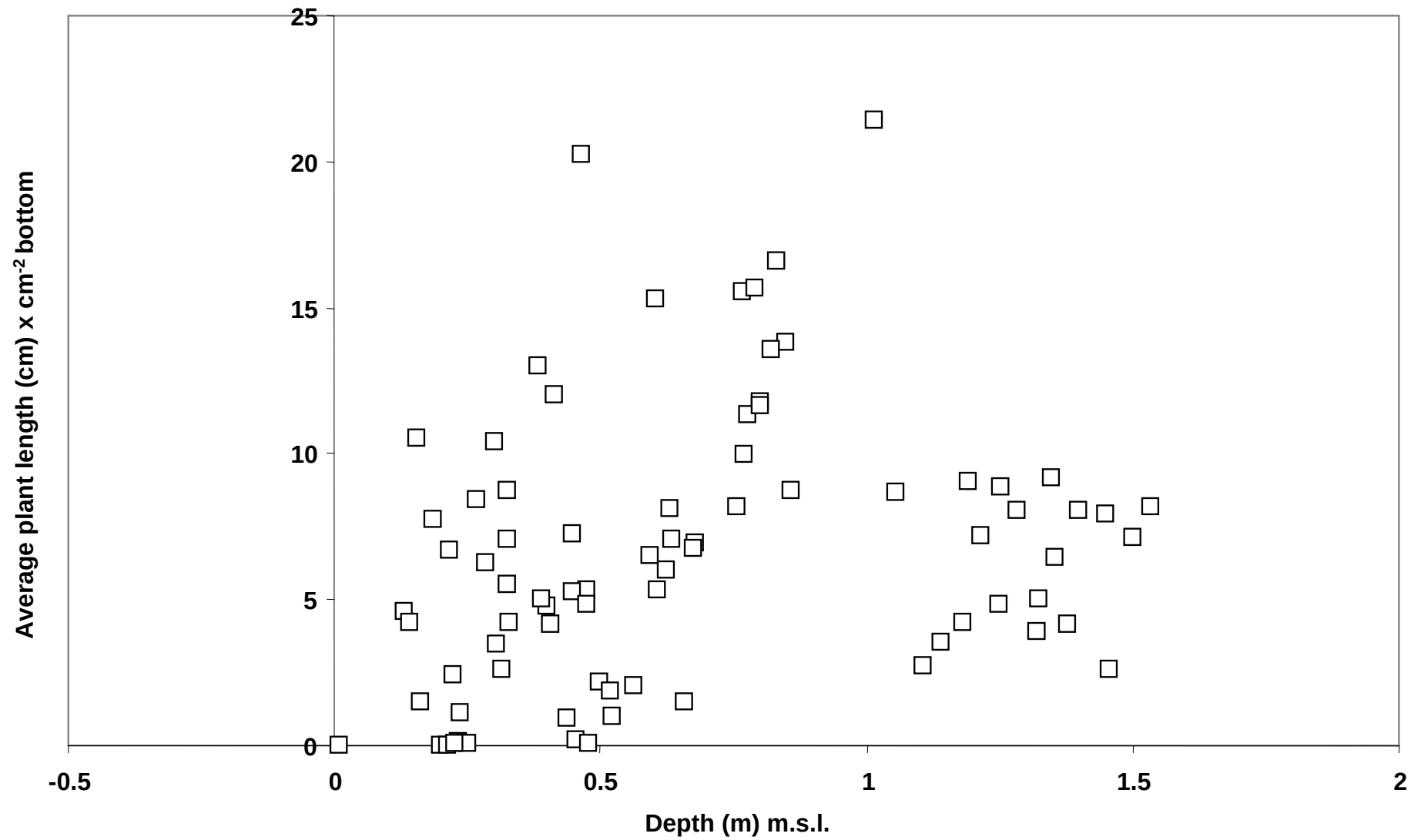


Figure 11.

Mean live biomass

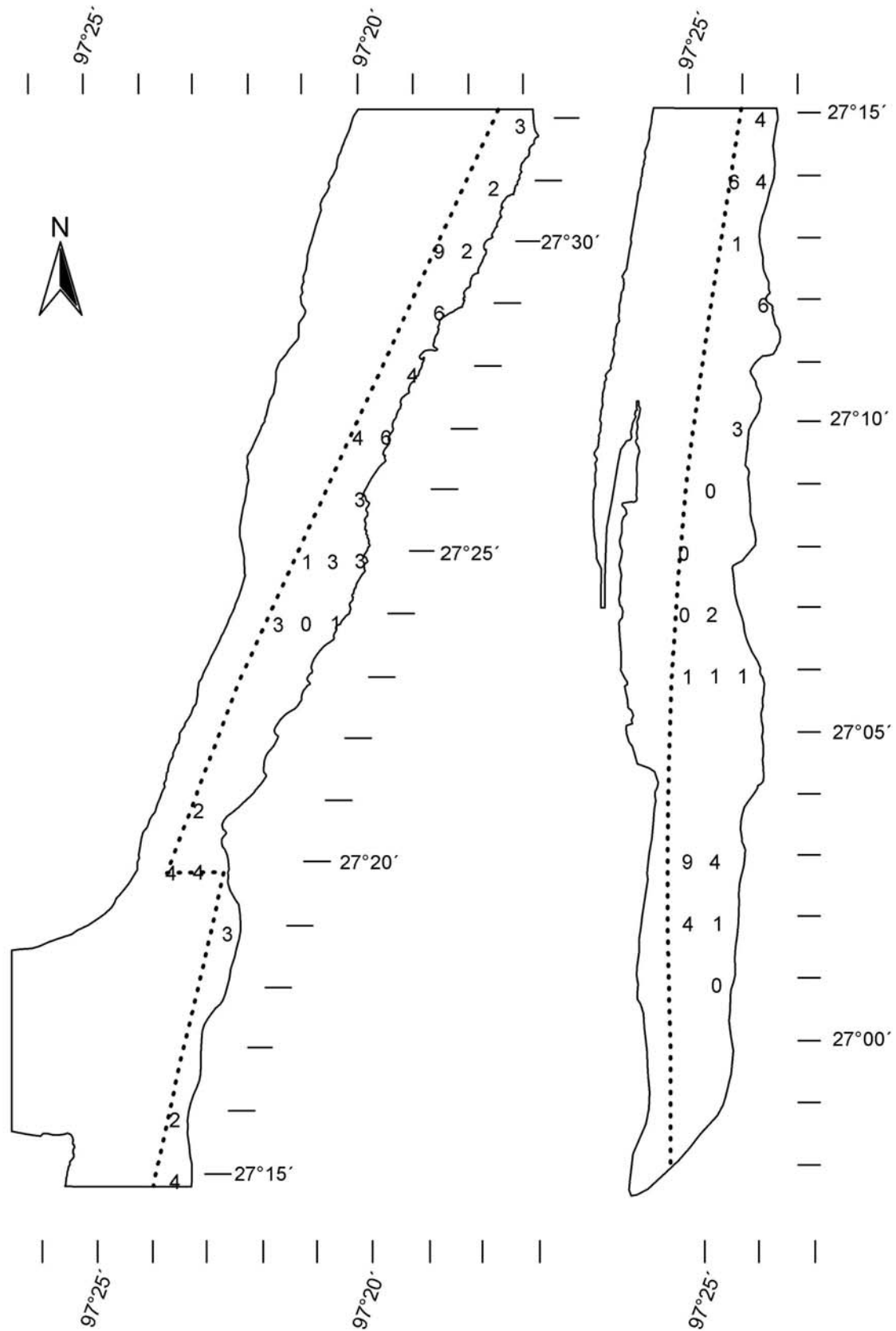


Figure 12.

Mean live biomass in relation to depth

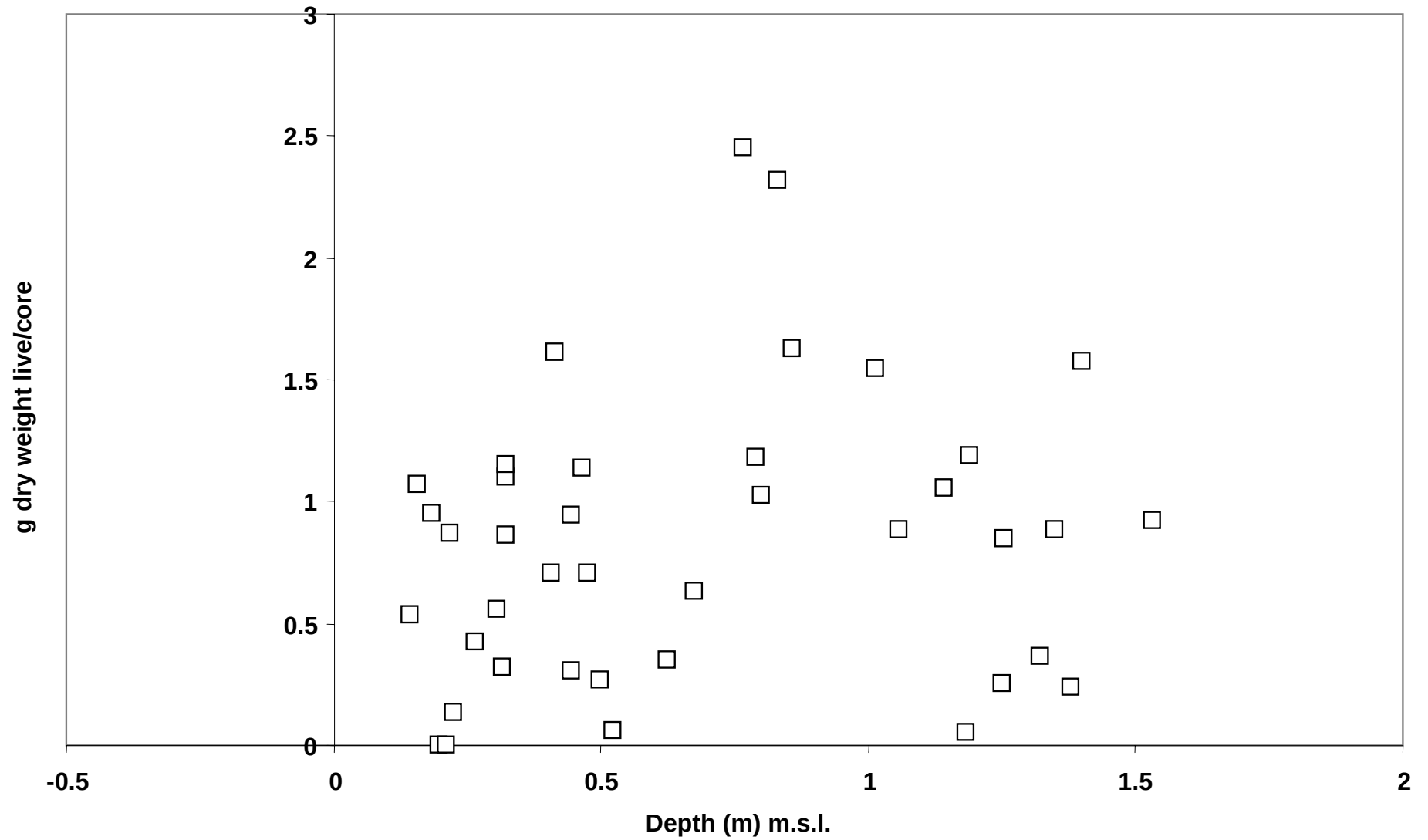


Figure 13.

Mean dead biomass

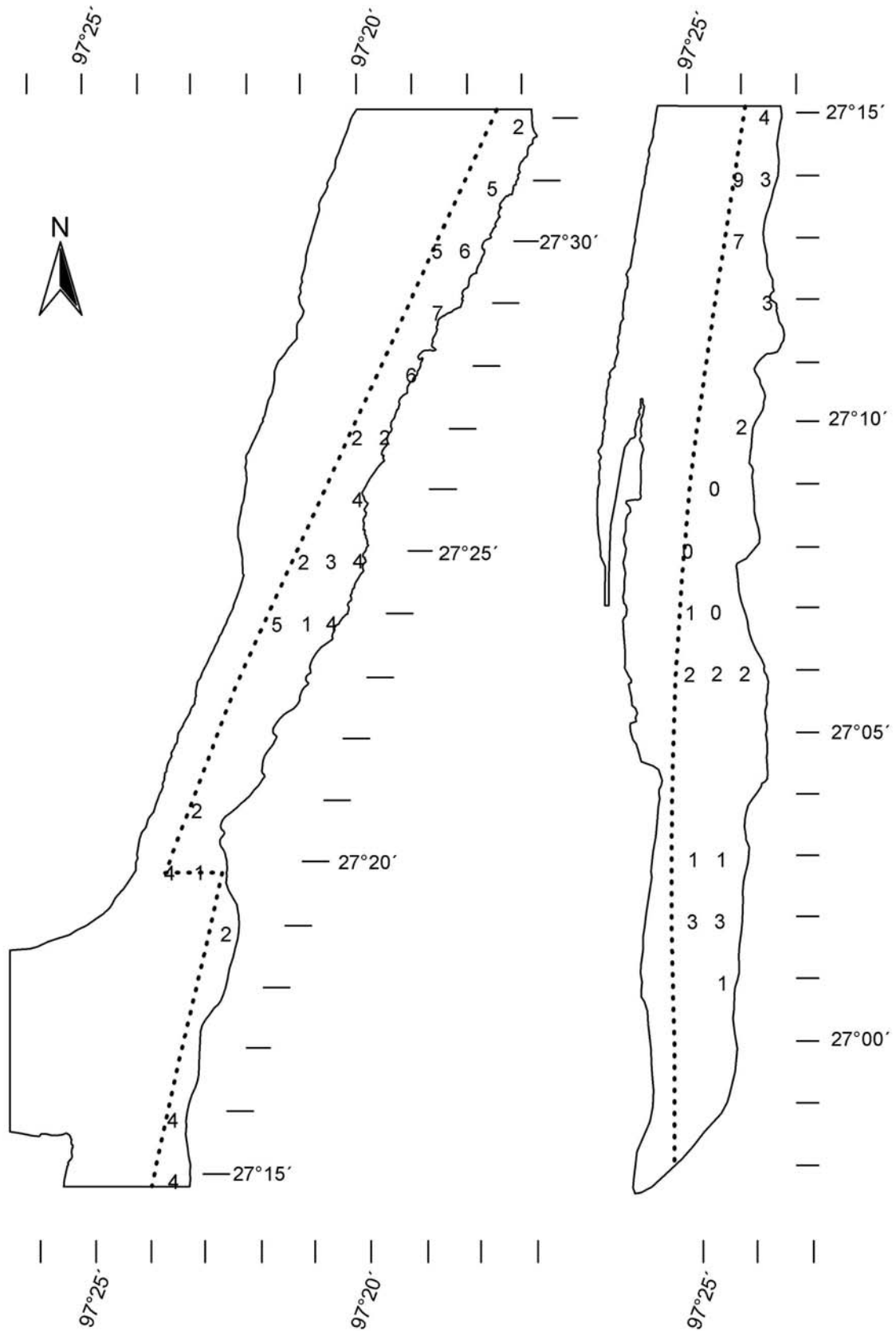


Figure 14.

Mean dead biomass in relation to depth

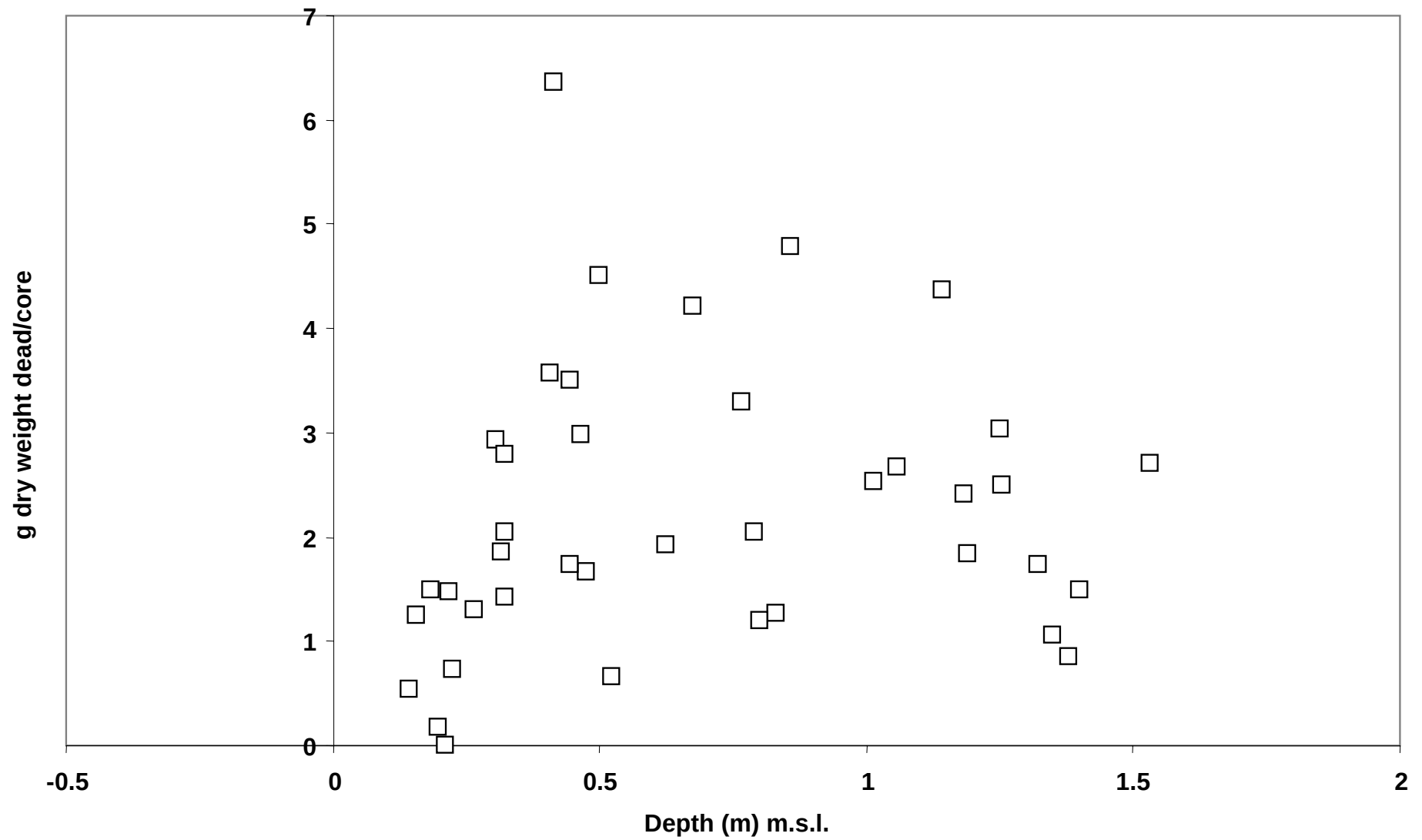


Figure 15.

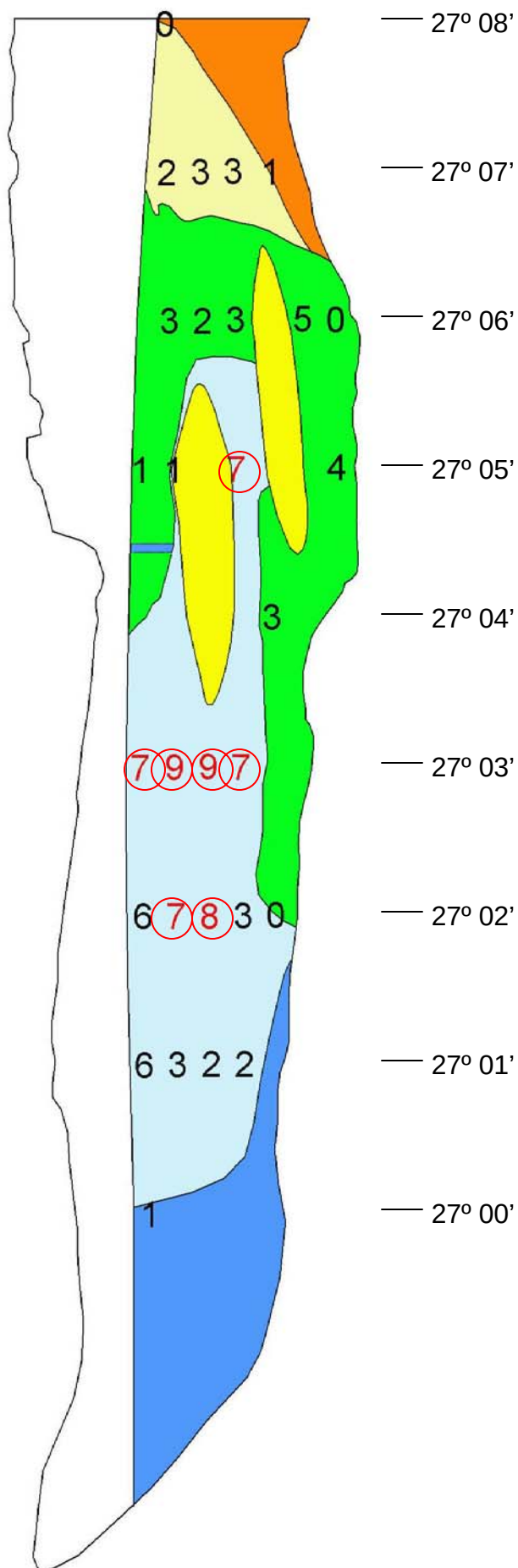


Figure 16.