APPENDIX IV-B

SPATIAL DATABASE REQUIREMENTS FOR APPLICATION OF ST. JOHN EROSION MODEL (STJ-EROS)

Attribute data descriptions and maps

for the following GIS data layers:

stj_bd, fb_bd, lb_bd, cb_bd, gps_dra, gps_rds, stj_str, banks, sed_del

ST. JOHN EROSION MODELING– SPATIAL DATABASE LAYER DEFINITION

Layer: **stj_bd**

Type: Polygon layer; UTM projection-Zone 20; Units in meters

Description: Contains the coastal boundaries of the island of St. John and adjacent cays as defined by USGS topographic maps.

Table Items:

Name	Width	Type	Decimal Places
AREA	13	N	0
PERIMETER	13	N	0
STJ_BD_	11	N	0
STJ_BD_ID	11	N	0

Item description:

Name	Description
AREA	ArcInfo item defining the total areal layerage of each polygon.
PERIMETER	ArcInfo item defining the total perimeter of each polygon.
STJ_BD_	ArcInfo identification number.
STJ_BD_ID	ArcInfo user identification number.

Uses in STJ-EROS: Used in the surf_erosion routine to create a 30 m coastline buffer. This buffer is created to avoid estimating sediment production rates from these areas as they are likely to be layered by beach deposits or rocky promontories.

ST. JOHN EROSION MODELING– SPATIAL DATABASE LAYER DEFINITION

Layer: **fb_bd**

Type: Polygon layer; UTM projection-Zone 20; Units in meters

Description: Contains the boundaries of the entire Fish Bay basin as defined by 40 ft contours.

Table Items:

Name	Width	Type	Decimal Places
AREA	13	N	0
PERIMETER	13	N	0
FB_BD_	11	N	0
FB_BD_ID	11	N	0

Item description:

Name	Description
AREA	ArcInfo item defining the total areal layerage of each polygon.
PERIMETER	ArcInfo item defining the total perimeter of each polygon.
FB_BD_	ArcInfo identification number.
FB_BD_ID	ArcInfo user identification number.

Uses in STJ-EROS: If the user chooses to run the model for the Fish Bay basin this layer is used by the following routines: a) Del_potential- By using a clip command this routine uses this layer to exclude areas outside of the Fish Bay basin from sed_del (delivery potential data layer); b) Rd_erosion- By using a clip command this routine uses this layer to exclude all road drainage points in gps_dra outside of the Fish Bay basin; and c) Surf_erosion- By using a clip command this routine uses this layer to remove all buffered coastlines located outside of the Fish Bay basin.

ST. JOHN EROSION MODELING– SPATIAL DATABASE LAYER DEFINITION

Layer: **lb_bd**

Type: Polygon layer; UTM projection-Zone 20; Units in meters

Description: Contains the boundaries of the entire Lameshur Bay basin as defined by 40 ft contours.

Table Items:

Name	Width	Type	Decimal Places
AREA	13	N	0
PERIMETER	13	N	0
LB_BD_	11	N	0
LB_BD_ID	11	N	0

Item description:

Name	Description
AREA	ArcInfo item defining the total areal layerage of each polygon.
PERIMETER	ArcInfo item defining the total perimeter of each polygon.
LB_BD_	ArcInfo identification number.
LB_BD_ID	ArcInfo user identification number.

Uses in STJ-EROS: If the user chooses to run the model for the Lameshur Bay basin this layer is used by the following routines: a) Del_potential- By using a clip command this routine uses this layer to exclude areas outside of the Lameshur Bay basin from sed_del (delivery potential data layer); b) Rd_erosion- By using a clip command this routine uses this layer to exclude all road drainage points in gps_dra outside of the Lameshur Bay basin; and c) Surf_erosion- By using a clip command this routine uses this layer to remove all buffered coastlines located outside of the Lameshur Bay basin.

ST. JOHN EROSION MODELING– SPATIAL DATABASE LAYER DEFINITION

Layer: **cb_bd**

Type: Polygon layer; UTM projection-Zone 20; Units in meters

Description: Contains the boundaries of portions of the Cinnamon Bay basin as defined by 40 ft contours. The area defined under this layer does not include the sub-catchment draining into Peter Bay.

Table Items:

Name	Width	Type	Decimal Places
AREA	13	N	0
PERIMETER	13	N	0
CB_BD_	11	N	0
CB_BD_ID	11	N	0

Item description:

Name	Description
AREA	ArcInfo item defining the total areal coverrage of each polygon.
PERIMETER	ArcInfo item defining the total perimeter of each polygon.
CB_BD_	ArcInfo identification number.
CB_BD_ID	ArcInfo user identification number.

Uses in STJ-EROS: If the user chooses to run the model for the Cinnamon Bay basin this layer is used by the following routines: a) Del_potential- By using a clip command this routine uses this layer to exclude areas outside of the Cinnamon Bay basin from sed_del (delivery potential data layer); b) Rd_erosion- By using a clip command this routine uses this layer to exclude all road drainage points in gps_dra outside of the Cinnamon Bay basin; and c) Surf_erosion- By using a clip command this routine uses this layer to remove all buffered coastlines located outside of the Cinnamon Bay basin.

ST. JOHN EROSION MODELING– SPATIAL DATABASE LAYER DEFINITION

Layer: **gps_dra**

Type: Point layer, UTM projection-Zone 20; Units in meters

Description: Contains locations of all road drainage structures within the Lameshur Bay and Fish Bay basins, as well as portions of the Bordeaux Mountain road, Catherineberg, Maho Bay, and Susannaberg Estates, and Haulover Bay. Full description of all attributes currently exist only for those drainage structures within the Fish Bay basin, the Lameshur Bay basin, and those along John Head Road in the Catherineberg area draining into Cinnamon Bay.

Table Items:

Name	Width	Type	Decimal Places
AREA	13	N	6
PERIMETER	13	N	6
GPS_DRA_	11	N	0
GPS_DRA_ID	11	N	0
TYPE	20	C	0
DRAIN_ID	8	C	0

Item description:

Name	Description
AREA	Area of each drainage point. All areas will equal zero as the layer is built as a point layerage.
PERIMETER	Perimeter of each road drainage point. All perimeters will equal zero as the layer is built as a point layerage.
GPS_DRA_	ArcInfo identification number.
GPS_DRA_ID	ArcInfo user identification number.
TYPE	Describes the type of road drainage structure among the following options: swale, cemented or uncemented swale, culvert, ditch, gut crossing, or unknown.
DRAIN_ID	A user-defined drainage structure identification code. These identification codes correspond to codes in ‘gps_rds’ and serve to link an individual road segment with a specific road drainage structure. The relationship between a drainage structure and a road segment is not unique as a drainage point may drain more than one road segment. The code consists in two or three letters followed by a number. The letters identify the general location of the drainage point as follows: ‘ufb’- Adrian Estate and portions of Catherineberg Estate in the upper Fish Bay basin; ‘lfb’- Fish Bay Estate in the lower Fish Bay basin; ‘le’- L’Esperance and Sieben Estates within the Fish Bay basin; ‘cb’- Catherineberg Estate draining towards Cinnamon Bay; and ‘lb’- entire Lameshur Bay basin. The numbers identify specific drains within each one of the zones.

Uses in STJ-EROS: Used by the rd_erosion routine. The location of each individual road drainage point is used in combination with the chosen basin boundary to eliminate points located outside of the area. This layer is also used to identify the sediment delivery potential of each drainage point. A joinitem command is used by this routine to link the delivery potentials of the drainage points with their respective road segments by way of the drain_id item.

ST. JOHN EROSION MODELING– SPATIAL DATABASE LAYER DEFINITION

Layer: **gps_rds**

Type: Line layer; UTM projection-Zone 20; Units in meters

Description: Contains locations of all roads within the Lameshur Bay and Fish Bay basins, as well as portions of the Bordeaux Mountain road, Catherineberg, Maho Bay, and Susannaberg Estates, and Haulover Bay. Full description of all attributes currently exist only for those roads within the Fish Bay basin, the Lameshur Bay basin, and those along John Head Road in Catherineberg Estate.

Table Items:

Name	Width	Type	Decimal Places
FNODE_	11	N	0
TNODE_	11	N	0
LPOLY_	11	N	0
RPOLY_	11	N	0
LENGTH	13	N	6
GPS_RDS_	11	N	0
GPS_RDS_ID	11	N	0
SURFACE	16	C	0
LENGTH_M	8	N	0
WIDTH_M	8	N	1
SLOPE	8	N	2
GRADING	16	C	0
SOURCE	16	C	0
DRAIN_ID	8	C	0
BASIN	8	C	0

Item description:

Name	Description
FNODE_	ArcInfo topological item. All values equal to zero as the layer was built with line features.
TNODE_	ArcInfo topological item. All values equal to zero as the layer was built with line features.
LPOLY_	ArcInfo topological item. All values equal to zero as the layer was built with line features.
RPOLY_	ArcInfo topological item. All values equal to zero as the layer was built with line features.
LENGTH	ArcInfo item defining the map length of the linear feature.
GPS_RDS_	ArcInfo identification number.
GPS_RDS_	ArcInfo user identification number.
SURFACE	Describes whether the road surface is paved or unpaved.
LENGTH_M	Defines the field measured length of each individual road segment in meters.
WIDTH_M	Defines the field measured average width of each individual road segments in meters.

SLOPE	Defines the field measured areally-averaged slope of each individual road segment in percent (m m^{-1}).
GRADING	Describes the frequency at which unpaved road segments are regraded according to the following three categories: 1) graded- roads that are graded for more than two years; 2) ungraded- roads that have not been graded in the last two years; 3) abandoned- roads that are infrequently used by light vehicles and have not been graded in over fifteen years.
SOURCE	Describes whether spatial data was collected by a GPS unit or it was derived from an already existing road USGS layer.
DRAIN_ID	A user-defined drainage structure identification code. These identification codes correspond to codes in 'gps_dra' and serve to link an individual road segment with a specific road drainage structure. The relationship between a drainage structure and a road segment is not unique as a drainage point may drain more than one road segment. The code consists in two or three letters followed by a number (See 'gps_dra" layer description for explanation.).
BASIN	Defines the watershed where the sediment produced by the road is discharged. A two-letter code is used for this item: 'cb'- Cinnamon Bay sub-catchment; 'fb'- Fish Bay basin; and 'lb'- Lameshur Bay basin.

Uses in STJ-EROS: Used by the rd_erosion routine. A copy of gps_rds is created by this routine. The drain_id item in this new layer is used to determine the delivery potential for each road segment by way of a joinitem command with a newly created road drainage layer. The length_m, width_m, slope, grading, and del_ratio items are used to calculate road and cutslope sediment production and delivery. At the end of the rd_erosion routine the gps_rds copy layer contains all of the models road-related sediment production and delivery estimates.

ST. JOHN EROSION MODELING– SPATIAL DATABASE LAYER DEFINITION

Layer: **stj_str**

Type: Line layer; UTM projection-Zone 20; Units in meters

Description: Stream data layer for the entire island of St. John. The layer contains all stream features contained in USGS topographical maps, as well as stream extensions based on field reconnaissance. A channel was defined in the field by the presence of a morphological feature with a recognizable bank and a streambed composed of fluvial deposits.

Table Items:

Name	Width	Type	Decimal Places
FNODE_	11	N	0
TNODE_	11	N	0
LPOLY_	11	N	0
RPOLY_	11	N	0
LENGTH	13	N	6
STJ_STR_	11	N	0
STJ_STR_ID	11	N	0
SOURCE	16	C	0

Item description:

Name	Description
FNODE_	ArcInfo topological item. All values equal to zero as the layer was built as a line layer.
TNODE_	ArcInfo topological item. All values equal to zero as the layers was built as a line layer.
LPOLY_	ArcInfo topological item. All values equal to zero as the layers was built as a line layer.
RPOLY_	ArcInfo topological item. All values equal to zero as the layers was built as a line layer.
LENGTH	ArcInfo item defining the map length of the linear feature.
STJ_STR_	ArcInfo identification number
STJ_STR_ID	ArcInfo user identification number.
SOURCE	Describes whether the stream arc was derived from field reconnaissance or from an already existing stream layerage based on USGS maps.

Uses in STJ-EROS: Used by the stream_total routine. A clip command is used by the routine to maintain only the stream segments located within the basin chosen by the user. This new stream layer is then buffered so that it can be overlayed by way of an union command with the polygon layer resulting from the streambank routine. The perimeter of the final layer is used as a surrogate for length to calculate sediment production and delivery by treethrow.

ST. JOHN EROSION MODELING– SPATIAL DATABASE LAYER DEFINITION

Layer: **banks**

Type: Polygon layer; UTM projection-Zone 20; Units in meters

Description: Contains location and attribute data of streams with erodible banks within the Fish Bay, Lameshur Bay, and Reef Bay basins based on field reconnaissance. No significant stream segments with erodible banks were found in the Hawksnest or Cinnamon Bay catchments. Erodible banks are found in St. John in those areas where well-defined stream channel features cut through alluvial/colluvial deposits. Stream segments with erodible banks were isolated and buffered using a 0.25 m buffering distance. Such a short buffer was used so that the total length of stream segments with erodible banks could be approximated as being approximately half of their perimeters.

Table Items:

Name	Width	Type	Decimal Places
AREA	13	N	6
PERIMETER	13	N	6
BANKS_	11	N	0
BANKS_ID	11	N	0
INSIDE	11	N	0
BANK_HT_M	8	N	1

Item description:

Name	Description
AREA	ArcInfo item defining the total areal layerage of each individual stream polygon segment.
PERIMETER	ArcInfo item defining the total perimeter of each individual polygon segment.
BANKS_	ArcInfo identification number.
BANKS_ID	ArcInfo user identification number.
INSIDE	ArcInfo topological item. A value of 100 is assigned for stream polygons and no value is assigned to the universal polygon.
BANK_HT_M	Indicates the approximate height of erodible streambanks in meters. Average height of banks was determined during field surveys.

Uses in STJ-EROS: Used by the streambank routine. First, a new layer is created by an intersect command using this layer and a delivery potential layer created during the del_potential routine. This new layer contains bank segments within the basin chosen by the user with their corresponding perimeter, bank_ht_m, and del_ratio items. Table commands are used to calculate sediment production and delivery for each stream segment.

ST. JOHN EROSION MODELING– SPATIAL DATABASE LAYER DEFINITION

Layer: **sed_del**

Type: Polygon layer; UTM projection-Zone 20; Units in meters

Description: Displays the spatial distribution of the potential for terrestrial sediments to be delivered to the marine environments. The criteria used to develop the delivery potential zones is based on the interaction between guts draining a specific sub-catchment within a basin and detention ponds, salt ponds, or wetland areas (see description below). Sediment delivery potential zones have been defined for the entire Fish Bay and Lameshur Bay basins, and all sub-catchments draining into Cinnamon Bay with the exception of those draining directly into Peter Bay.

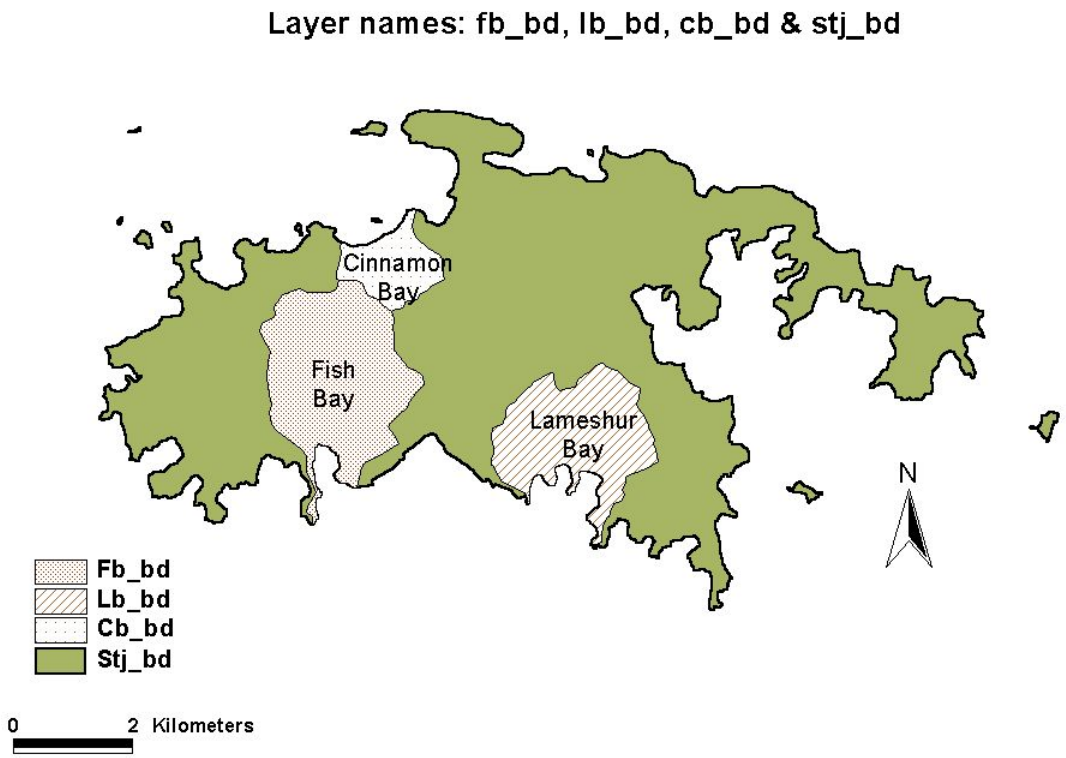
Table Items:

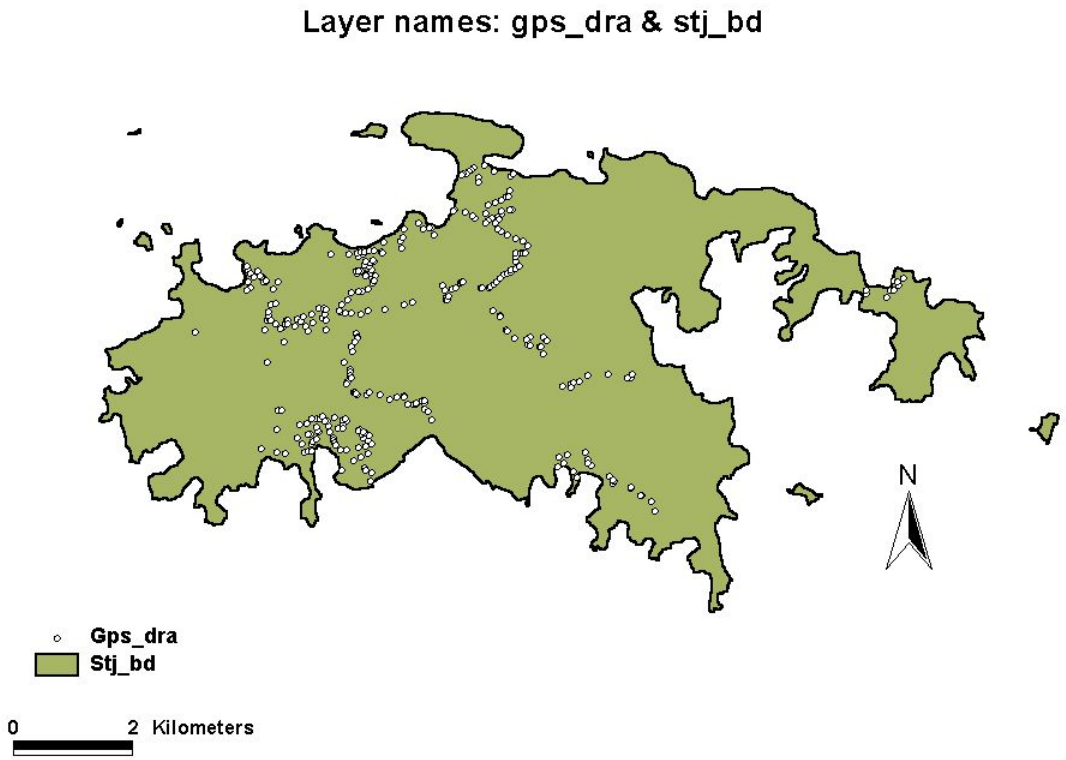
Name	Width	Type	Decimal Places
AREA	13	N	6
PERIMETER	13	N	6
SED_DEL_	11	N	0
SED_DEL_ID	11	N	0
POTENTIAL	10	C	0

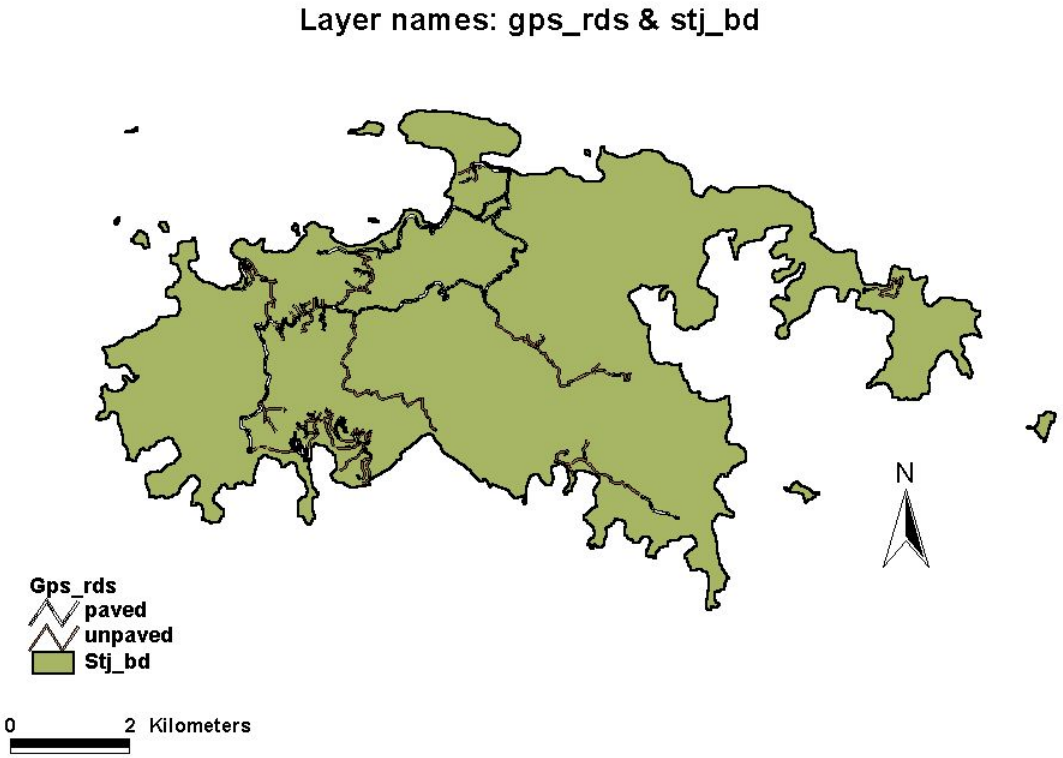
Item description:

Name	Description
AREA	ArcInfo item defining the total areal layerage of each delivery potential polygon.
PERIMETER	ArcInfo item defining the total perimeter of each delivery potential polygon.
SED_DEL_	ArcInfo identification number.
SED_DEL_ID	ArcInfo user identification number.
POTENTIAL	A qualitative description of the potential for terrestrial sediment delivery into the marine environment based on the interaction between a gut draining an area and any detention ponds, salt ponds, or wetland areas. Areas are divided into one of the following four categories: 1) ‘no’- Areas with no potential for sediment delivery include those drained by a gut that is interrupted by a pond or unchannelled area and lacks any surface pathway connecting it to the marine environment; 2) ‘moderate’- areas that drain into a pond or wetland area that has a channel-like feature connecting it with the marine environment; 3) ‘wetlands’- All wetland areas are identified separately, but they are considered to have the same delivery potential as moderate areas; and 4) ‘high’- areas drained by a gut that is not interrupted by any pond or wetland area, so that it is able to directly deposit sediment into the marine environment.

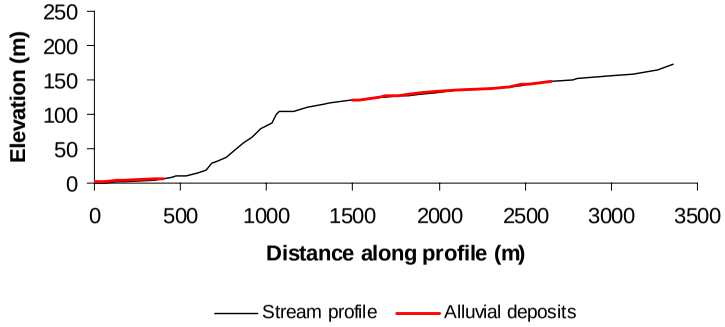
Uses in STJ-EROS: Used by the del_potential routine. A clip command is used by this routine to select only those delivery potential areas within the basin chosen by the user. The newly created layer, del_bd, is then used by the rd_erosion, streambank, stream_total, and surf_er routines to assign sediment delivery ratios to numerous layers which allows the calculation of sediment yield rates


Layer names: fb_bd, lb_bd, cb_bd & stj_bd
Cinnamon Bay
Fish Bay
Lameshur Bay
N
Fb_bd
Lb_bd
Cb_bd
Stj_bd
0
2 Kilometers

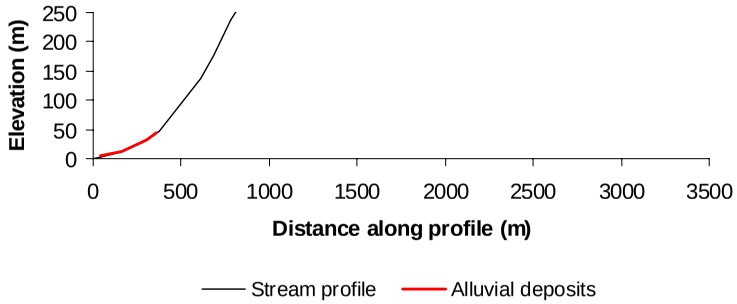

Layer names: gps_dra & stj_bd
N
Gps_dra
Stj_bd
0
2 Kilometers


Layer names: gps_rds & stj_bd
N
Gps_rds
paved
unpaved
Stj_bd
0
2 Kilometers

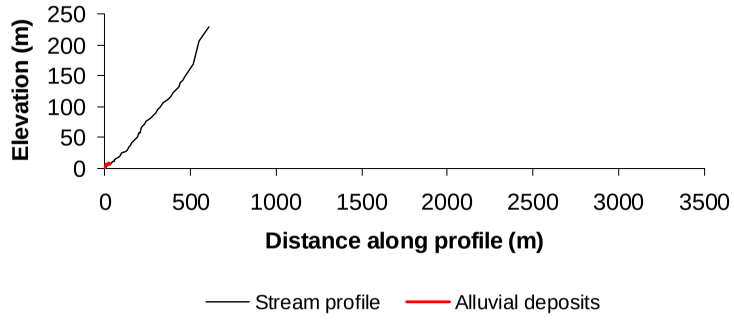
Appendix IV-B. Long profile of Fish Bay Gut and Battery Gut showing the location of eroding banks.



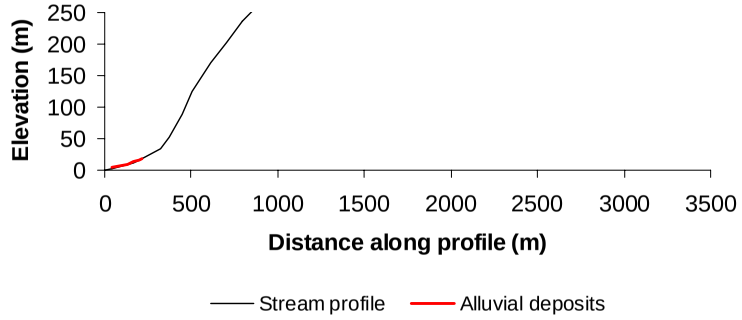
Appendix IV-B- Long profile of Reef Bay 1st-order B showing the location of eroding banks.

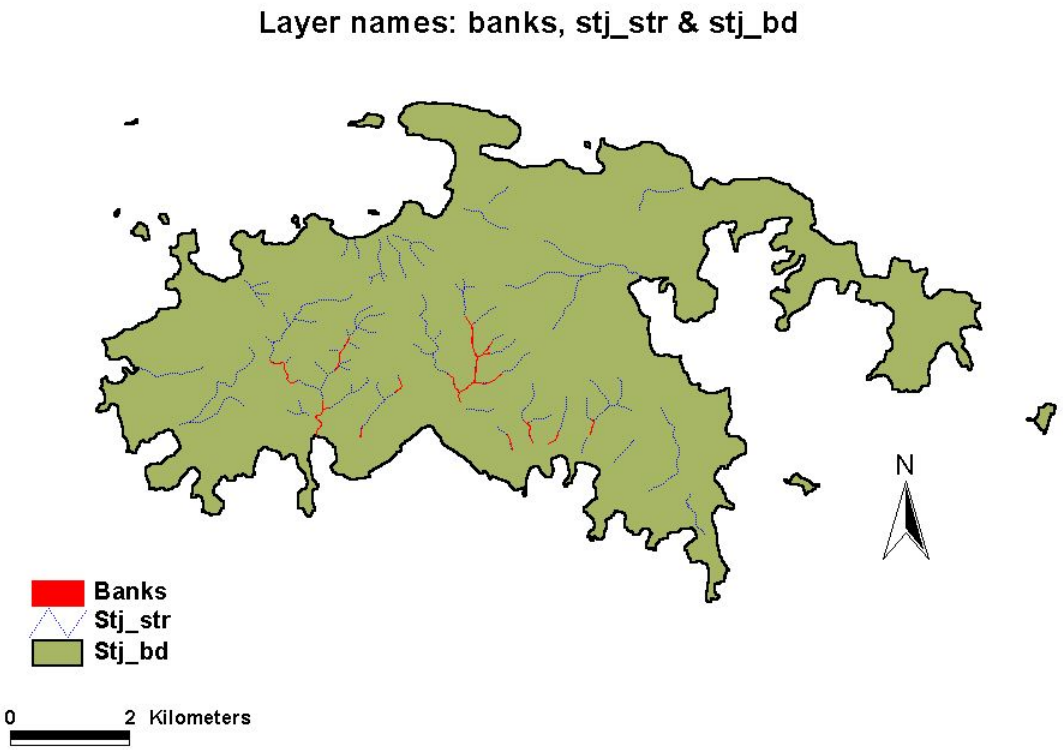


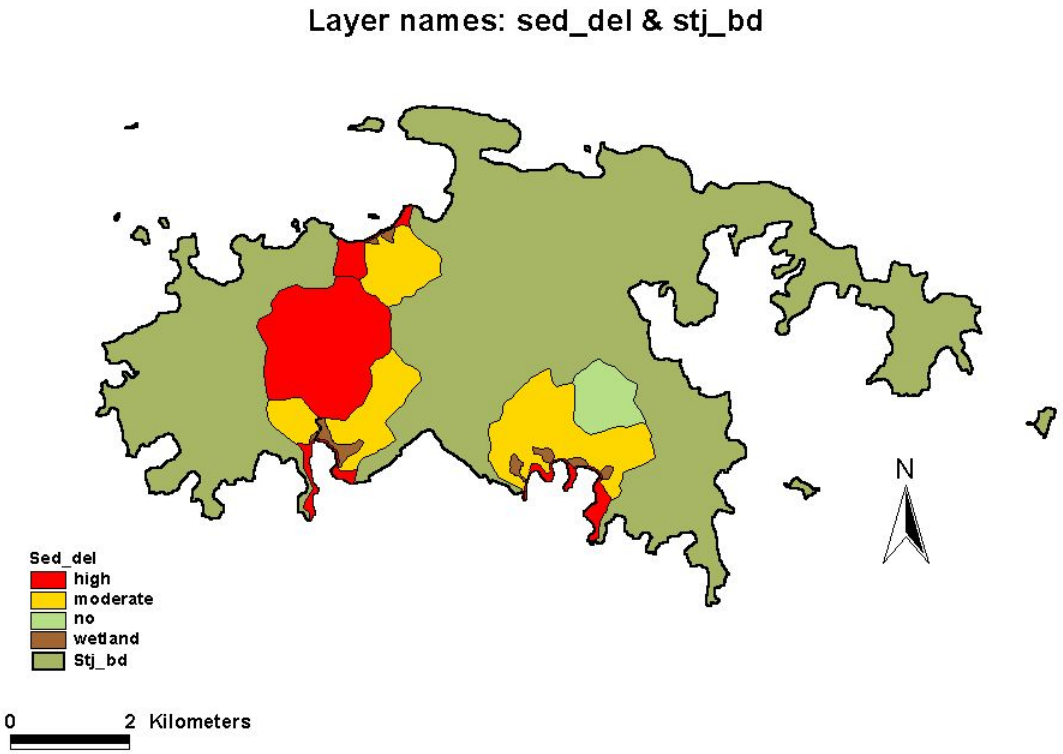
Appendix IV-B- Long prifle of Reef Bay 1st-order A showing the location of eroding banks.



Appendix IV-B- Long profile of Reef Bay 1st and 2nd-order C showing the location of eroding banks.




Layer names: banks, stj_str & stj_bd
N
Banks
Stj_str
Stj_bd
0
2 Kilometers


Layer names: sed_del & stj_bd
N
Sed_del
high
moderate
no
wetland
Stj_bd
0
2 Kilometers