U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science Directorate
Geologic Resources Division

Dry Tortugas National Park

GRI Ancillary Map Information Document

Produced to accompany the Geologic Resources Inventory (GRI) Digital Geologic Data for Dry Tortugas National Park

drto_benthic_habitat.pdf

Version: 6/9/2026

Geologic Resources Inventory Map Document for Dry Tortugas National Park

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Geologic Resources Inventory Map Document

Dry Tortugas National Park, Florida

Document to Accompany Digital Geologic-GIS Data

drto_benthic_habitat.pdf

Version: 6/9/2026

This document has been developed to accompany the digital geologic-GIS data developed by the Geologic Resources Inventory (GRI) program for Dry Tortugas National Park, Florida (DRTO).

Attempts have been made to reproduce all aspects of the original source products, including the geologic units and their descriptions, geologic cross sections, the geologic report, references and all other pertinent images and information contained in the original publication.

This document contains the following information:

1) **About the NPS Geologic Resources Inventory Program** – A brief summary of the Geologic Resources Inventory (GRI) Program and its products. Included are web links to the GRI GIS data model, and to the GRI products page where digital geologic-GIS datasets, scoping reports and geology reports are available for download. In addition, web links to the NPS Data Store and GRI program home page, as well as contact information for the GRI coordinator, are also present.

2) **GRI Digital Maps and Source Map Citations** – A listing of the GRI digital benthic habitat-GIS map produced for this project along with the source map used for the project.

3) **Map Unit List** – A listing of all benthic habitat units present on the map.

4) **Map Unit Descriptions** – Descriptions for all benthic habitat map units.

5) **Ancillary Source Map Information** – Additional source map information presented by source map.

6) **GRI Digital Data Credits** – GRI digital geologic-GIS data and ancillary map information document production credits.

For information about using GRI digital geologic-GIS data contact:

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About the NPS Geologic Resources Inventory Program

Background

The Geologic Resources Inventory (GRI) provides geologic map data and pertinent geologic information to support resource management and science-informed decision making in more than 270 natural resource parks throughout the National Park System. Geologic resources for management consideration include both the processes that act upon the Earth and the features formed as a result of these processes. Geologic processes include: erosion and sedimentation; seismic, volcanic, and geothermal activity; glaciation, rockfalls, landslides, and shoreline change. Geologic features include mountains, canyons, natural arches and bridges, minerals, rocks, fossils, cave and karst systems, beaches, dunes, glaciers, volcanoes, and faults.

The GRI is one of 12 inventories funded by the National Park Service (NPS) Inventory and Monitoring Program. The Geologic Resources Division of the NPS Natural Resource Stewardship and Science Directorate administers the GRI. The NPS Geologic Resources Division partners with the Colorado State University Department of Geosciences to produce GRI products. Many additional partners participate in the GRI process by contributing source maps or reviewing products.

The GRI team undertakes three tasks for each park in the Inventory and Monitoring program: (1) conduct a scoping meeting and provide a summary document, (2) provide digital geologic map data in a geographic information system (GIS) format, and (3) provide a GRI report. These products are designed and written for nongeoscientists.

Products

Scoping Meetings: These park-specific meetings bring together local geologic experts and park staff to inventory and review available geologic data and discuss geologic resource management issues. A summary document is prepared for each meeting that identifies a plan to provide digital map data for the park.

Digital Geologic Maps: Digital geologic maps reproduce all aspects of traditional paper maps, including notes, legend, and cross sections. Bedrock, surficial, and special purpose maps such as coastal or geologic hazard maps may be used by the GRI to create digital Geographic Information Systems (GIS) data and meet park needs. These digital GIS data allow geologic information to be easily viewed and analyzed in conjunction with a wide range of other resource management information data.

For detailed information regarding GIS parameters such as data attribute field definitions, attribute field codes, value definitions, and rules that govern relationships found in the data, refer to the NPS Geology-GIS Data Model document available at: https://www.nps.gov/articles/gri-geodatabase-model.htm

Geologic Reports: GRI reports synthesize discussions from the original scoping meeting, follow up conference call(s), and subsequent research. Chapters of each report discuss the geologic setting of the park, distinctive geologic features and processes within the park, highlight geologic issues facing resource managers, and describe the geologic history leading to the present-day landscape. Each report also includes a poster illustrating these GRI digital geologic-GIS data.

For a complete listing of GRI products visit the GRI publications webpage: https://go.nps.gov/gripubs. GRI digital geologic-GIS data is also available online at the NPS Data Store: https://irma.nps.gov/DataStore/Search/Quick. To find GRI data for a specific park or parks select the appropriate park(s), enter “GRI” as a Search Text term, and then select the Search button.

For more information about the Geologic Resources Inventory Program visit the GRI webpage: https://www.nps.gov/subjects/geology/gri.htm. At the bottom of that webpage is a “Contact Us” link if you need additional information. You may also directly contact the program coordinator:

Rebecca Port
Inventory Coordinator
National Park Service Geologic Resources Division
email: rebecca_port@nps.gov

The Geologic Resources Inventory (GRI) program is funded by the National Park Service (NPS) Inventory and Monitoring (I&M) Division. Learn more about I&M and the 12 baseline inventories at the I&M webpage: https://www.nps.gov/im/inventories.htm.

GRI Digital Maps and Source Map Citation

The GRI digital geologic-GIS maps for Dry Tortugas National Park, Florida (DRTO):

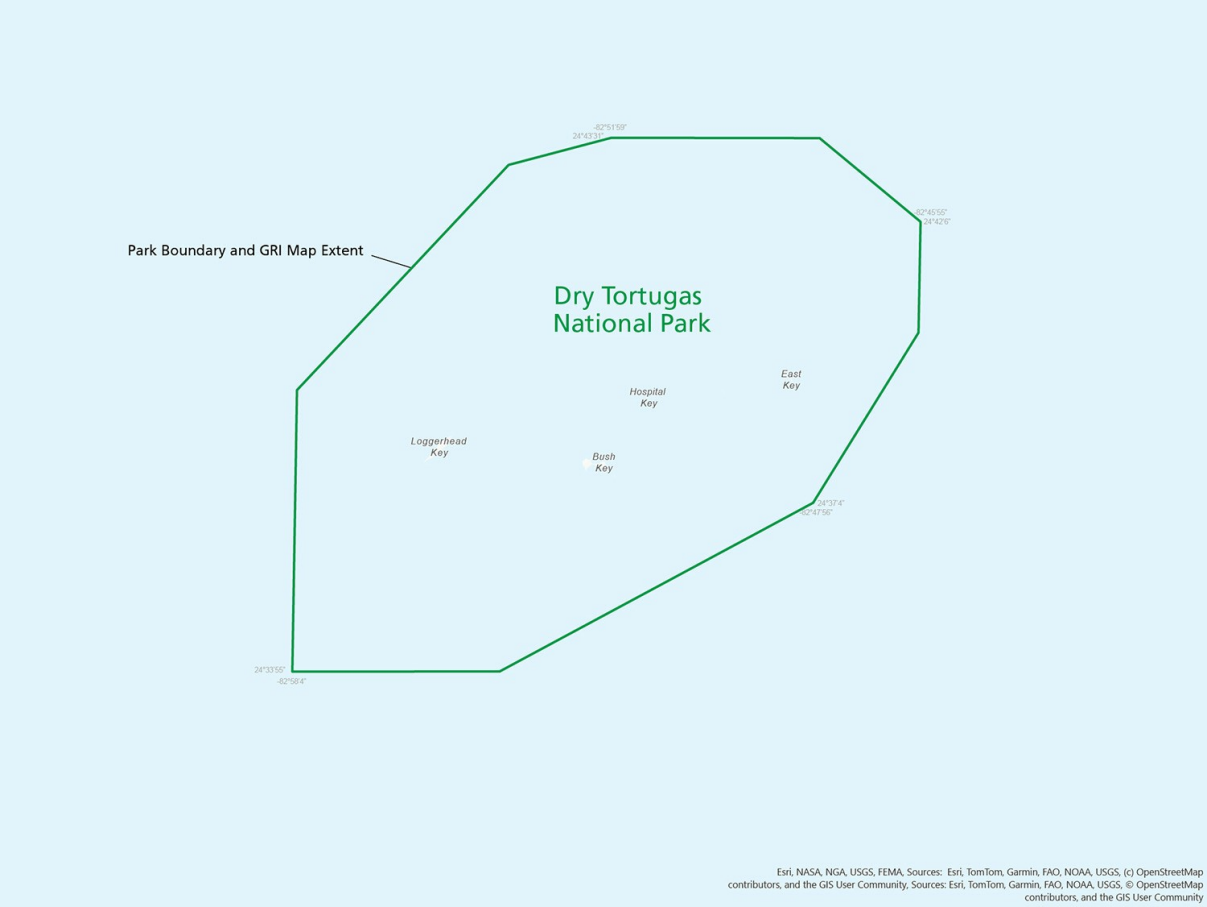
Digital Benthic Habitat-GIS Map of Dry Tortugas National Park, Florida (*GRI MapCode DRTO_benthic*)

> Waara, R.J., et al., 2011, The 2010 Benthic Habitat Map For Dry Tortugas National Park: National Park Service, Natural Resource Technical Report NPS/SFCN/NRTR-2011/474, scale 1:2,000 (Dry Tortugas (2010 Benthic Habitat)). (*GRI Source Map ID 75456*).
>
> The full extent of the source map was used, and all benthic habitat features within this extent were captured.

Additional information pertaining to each source map is also presented in the GRI Source Map Information (DRTOMAP) table included with the GRI digital geologic-GIS data.

Index Map

The following index map displays the extents of the GRI digital geologic-GIS maps produced for Dry Tortugas National Park (DRTO). The GRI map extent and boundary for Dry Tortugas National Park (as of June 2026) is outlined in green.



Index map by Ron Karpilo (Colorado State University)

Map Unit List

The benthic habitat units present in the digital benthic habitat-GIS data produced for Dry Tortugas National Park, Florida (DRTO) are listed below. Units are listed with their assigned unit symbol and unit name (e.g., agg_ptch_rf - Aggregated Patch Reefs). Information about each unit is also presented in the GRI Geologic Unit Information (DRTOUNIT) table included with the GRI digital geologic-GIS data.

Recent

agg_ptch_rf - Aggregated Patch Reefs
con_srv - Continuous Submersed Root Vascular Plants
discon_srv - Discontinuous Submersed Root Vascular Plants
hgh_rlf_sg - High Relief Spur and Groove
ind_ptch_rf - Individual Patch Reefs
land - Land
lw_rlf_sg - Low Relief Spur and Groove
ptch_crl_un - Patchy Coral and/or Rock in Unconsolidated Bottom
pvmnt - Pavement
rf_rbbl - Reef Rubble
rf_trce_hgh - Reef Terrace (high profile)
rmnt_lw - Remnant (low profile)
uncon_sdmt - Unconsolidated Sediment

Map Unit Descriptions

Descriptions of all benthic habitat units are presented below.
All unit descriptions from source map: Dry Tortugas (2010 Benthic Habitat)
See Appendix in the source map report for detailed information about the habitat classification system.

agg_ptch_rf - Aggregated Patch Reefs (Recent)

3. Reef/Hardbottom - Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms or exposed bedrock, possibly with various degrees of concealment from attached plant and animal colonization. Unconsolidated bottom and SAV may occur within these habitats, although in less abundance than the reef/hardbottom.

31. Coral Reef - Hardened substrate formed by reef building corals. May be live coral or relict reefs. Often bedrock is the base for these reefs but the presence of coral or remnant coral on the surface is reason to categorize the dominant habitat as coral reef.

312. Patch Reefs - Irregularly shaped reef communities. They may range in size from tens to thousands of square meters. Patches are separated from each other by uncolonized hardbottom, sand, or colonized substrate with submersed aquatic vegetation (SAV), macroalgae, gorgonians or sponges. Most often the patches are surrounded by a halo of bare substrate created by foraging, obligate reef inhabitants.

3124. Aggregated Patch Reefs (includes Halo areas if present) - Clustered patch reefs, usually too small (less than the minimum mapping unit) or too close together to map individually or where halos coalesce.

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con_srv - Continuous Submersed Root Vascular Plants (Recent)

2. Submersed Aquatic Vegetation (SAV) - Any combination of SAV (i.e. seagrasses, oligohaline grasses, attached macroalgae and drift macroalgae) that covers 10 to 100 percent of a substrate. If reef or hardbottom is more abundant than the SRV the polygon should be recorded as Reef/ Hardbottom Class and SRV should be noted with Modifiers.

21. Submersed Rooted Vascular Plants (SRV) (i.e. seagrasses and oligohaline grasses) - Habitat with 10 percent or more cover of SRV.

211. Continuous SRV - This includes continuous beds of any shoot density (i.e. sparse continuous, dense continuous or any combination). These areas appear as continuous seagrass signatures; however, small (less than 0.5 acres) bare sediment areas may be observed as infrequent features within the area.

2111. Dense patches of SRV in a matrix of continuous, sparse SRV - Continuous coverage of sparse SRV in which dense patches of SRV are clearly observed interspersed within the area. This pattern is often the result of effects from the sediment or underlying bedrock characteristics.

discon_srv - Discontinuous Submersed Root Vascular Plants (Recent)

2. Submersed Aquatic Vegetation (SAV) - Any combination of SAV (i.e. seagrasses, oligohaline grasses, attached macroalgae and drift macroalgae) that covers 10 to 100 percent of a substrate. If reef or hardbottom is more abundant than the SRV the polygon should be recorded as Reef/ Hardbottom Class and SRV should be noted with Modifiers.

21. Submersed Rooted Vascular Plants (SRV) (i.e. seagrasses and oligohaline grasses) - Habitat with 10 percent or more cover of SRV.

212. Discontinuous SRV - Areas of SRV with breaks in coverage that result in isolated patches of SRV, usually in unconsolidated bottom but also exist in hard bottom areas. If the hardbottom is more abundant than the SRV the polygon should be recorded as Reef/ Hardbottom Class and SRV can be noted with Modifiers. Generally, these grass features appear as semi-round patches or elongated strands separated by bare sediment.

hgh_rlf_sg - High Relief Spur and Groove (Recent)

3. Reef/Hardbottom - Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms or exposed bedrock, possibly with various degrees of concealment from attached plant and animal colonization. Unconsolidated bottom and SAV may occur within these habitats, although in less abundance than the reef/hardbottom.

31. Coral Reef - Hardened substrate formed by reef building corals. May be live coral or relict reefs. Often bedrock is the base for these reefs but the presence of coral or remnant coral on the surface is reason to categorize the dominant habitat as coral reef.

311. Platform Reef (also bank reef) - Hardened substrate formed by reef building corals that exist in a quasi-continuous structure along a shelf edge or similar dropoff removed from any coastline. These are typically elongate structures and may be referred to as bank reefs. The following Subclass categories may be present in various combinations within a platform reef.

3112. Spur and Groove - Distinct coral bands separated by sand or uncolonized hardbottom grooves. This habitat type usually occurs in the fore reef zone.

31121. High Relief Spur and Groove - Distinct coral bands separated by sand or uncolonized hardbottom grooves. The coral bands have 1.5- 4m relief.

ind_ptch_rf - Individual Patch Reefs (Recent)

3. Reef/Hardbottom - Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms or exposed bedrock, possibly with various degrees of concealment from attached plant and animal colonization. Unconsolidated bottom and SAV may occur within these habitats, although in less abundance than the reef/hardbottom.

31. Coral Reef - Hardened substrate formed by reef building corals. May be live coral or relict reefs. Often bedrock is the base for these reefs but the presence of coral or remnant coral on the surface is reason to categorize the dominant habitat as coral reef.

312. Patch Reefs - Irregularly shaped reef communities. They may range in size from tens to thousands of square meters. Patches are separated from each other by uncolonized

hardbottom, sand, or colonized substrate with submersed aquatic vegetation (SAV), macroalgae, gorgonians or sponges. Most often the patches are surrounded by a halo of bare substrate created by foraging, obligate reef inhabitants.

3121. Individual Patch Reef - Isolated, single reef (larger than the minimum mapping unit of the project) without associated halo area. These individual reefs may have an associated halo, however if large enough (i.e. greater than the minimum mapping unit) to be delineated the halo will be mapped as its own subclass.

land - Land (Recent)

6. Land - Mainland, islands, causeways and other land normally above the high tide line. Depending on the mapping project the line delineating the water/land interface may be formed anywhere between the extreme low and extreme high tide marks. **341. 342.**

lw_rlf_sg - Low Relief Spur and Groove (Recent)

3. Reef/Hardbottom - Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms or exposed bedrock, possibly with various degrees of concealment from attached plant and animal colonization. Unconsolidated bottom and SAV may occur within these habitats, although in less abundance than the reef/hardbottom.

31. Coral Reef - Hardened substrate formed by reef building corals. May be live coral or relict reefs. Often bedrock is the base for these reefs but the presence of coral or remnant coral on the surface is reason to categorize the dominant habitat as coral reef.

311. Platform Reef (also bank reef) - Hardened substrate formed by reef building corals that exist in a quasi-continuous structure along a shelf edge or similar dropoff removed from any coastline. These are typically elongate structures and may be referred to as bank reefs. The following Subclass categories may be present in various combinations within a platform reef.

3112. Spur and Groove - Distinct coral bands separated by sand or uncolonized hardbottom grooves. This habitat type usually occurs in the fore reef zone.

31122. Low Relief Spur and Groove - Distinct coral bands oriented perpendicular to the shore or bank and separated by sand or uncolonized hardbottom grooves. The coral bands have <1.5m relief.

ptch_crl_un - Patchy Coral and/or Rock in Unconsolidated Bottom (Recent)

3. Reef/Hardbottom - Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms or exposed bedrock, possibly with various degrees of concealment from attached plant and animal colonization. Unconsolidated bottom and SAV may occur within these habitats, although in less abundance than the reef/hardbottom.

31. Coral Reef - Hardened substrate formed by reef building corals. May be live coral or relict reefs. Often bedrock is the base for these reefs but the presence of coral or remnant coral on the surface is reason to categorize the dominant habitat as coral reef.

313. Patchy Coral and/or Rock in Unconsolidated Bottom - Areas of primarily sand, submerged aquatic vegetation (SAV), or low relief rock covered with a sand veneer. Often adjacent to spur and groove habitats, these areas contain small, individual corals or rocks that are distinctive yet a very low percentage of the total cover (and certainly smaller than the minimum mapping unit).

pvmnt - Pavement (Recent)

3. Reef/Hardbottom - Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms or exposed bedrock, possibly with various degrees of concealment from attached plant and animal colonization. Unconsolidated bottom and SAV may occur within these habitats, although in less abundance than the reef/hardbottom.

34. Hardbottom - Hard substrate composed of exposed bedrock or created through syndepositional cementation of sediment.

Bedrock - Exposed bedrock and/or rocky outcrops with low to high relief and high complexity.

Pavement (i.e. low relief hardbottom) - Flat, low relief, mostly solid rock substrate.

rf_rbbl - Reef Rubble (Recent)

3. Reef/Hardbottom - Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms or exposed bedrock, possibly with various degrees of concealment from attached plant and animal colonization. Unconsolidated bottom and SAV may occur within these habitats, although in less abundance than the reef/hardbottom.

31. Coral Reef - Hardened substrate formed by reef building corals. May be live coral or relict reefs. Often bedrock is the base for these reefs but the presence of coral or remnant coral on the surface is reason to categorize the dominant habitat as coral reef.

311. Platform Reef (also bank reef) - Hardened substrate formed by reef building corals that exist in a quasi-continuous structure along a shelf edge or similar dropoff removed from any coastline. These are typically elongate structures and may be referred to as bank reefs. The following Subclass categories may be present in various combinations within a platform reef.

3113. Reef Rubble - Dead, unstable coral rubble that often occurs landward of platform reefs.

rf_trce_hgh - Reef Terrace (high profile) (Recent)

3. Reef/Hardbottom - Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms or exposed bedrock, possibly with various degrees of concealment from attached plant and animal colonization. Unconsolidated bottom and SAV may occur within these habitats, although in less abundance than the reef/hardbottom.

31. Coral Reef - Hardened substrate formed by reef building corals. May be live coral or relict reefs. Often bedrock is the base for these reefs but the presence of coral or remnant coral on the surface is reason to categorize the dominant habitat as coral reef.

311. Platform Reef (also bank reef) - Hardened substrate formed by reef building corals that exist in a quasi-continuous structure along a shelf edge or similar dropoff removed from any coastline. These are typically elongate structures and may be referred to as bank reefs. The following Subclass categories may be present in various combinations within a platform reef.

3111. Linear Reef - Linear, contiguous coral formations. Reef crest, fore reef, and back reef zones could be mapped as Linear Reef. Most often has associated spur and groove and reef rubble habitats.

31111. Reef Terrace (high profile) - Contiguous reef with high complexity and high relief (>2m).

rmnt_lw - Remnant (low profile) (Recent)

3. Reef/Hardbottom - Hardened substrate of unspecified relief formed by the deposition of calcium carbonate by reef building corals and other organisms or exposed bedrock, possibly with various degrees of concealment from attached plant and animal colonization. Unconsolidated bottom and SAV may occur within these habitats, although in less abundance than the reef/hardbottom.

31. Coral Reef - Hardened substrate formed by reef building corals. May be live coral or relict reefs. Often bedrock is the base for these reefs but the presence of coral or remnant coral on the surface is reason to categorize the dominant habitat as coral reef.

311. Platform Reef (also bank reef) - Hardened substrate formed by reef building corals that exist in a quasi-continuous structure along a shelf edge or similar dropoff removed from any coastline. These are typically elongate structures and may be referred to as bank reefs. The following Subclass categories may be present in various combinations within a platform reef.

3111. Linear Reef - Linear, contiguous coral formations. Reef crest, fore reef, and back reef zones could be mapped as Linear Reef. Most often has associated spur and groove and reef rubble habitats.

31112. Remnant (low profile) - Reefs of relief less than 2m that lack distinctive spur and groove characteristics. These reefs consist of coral and hard bottom features; often support soft corals, sponges, seagrass; and are usually found growing parallel to the reef tract, though they may form transverse features that grow perpendicular to the reef tract.

uncon_sdmt - Unconsolidated Sediment (Recent)

1. Unconsolidated Sediments (zero to less than 10 percent colonization) - Unconsolidated sediments with less than 10 percent colonization by SAV or corals.

Ancillary Source Map Information

The following section presents ancillary source map information associated with the source used for this project.

Dry Tortugas (2010 Benthic Habitat)

The formal citation for this source.

> Waara, R.J., et al., 2011, The 2010 Benthic Habitat Map For Dry Tortugas National Park: National Park Service, Natural Resource Technical Report NPS/SFCN/NRTR-2011/474, scale 1:2,000 (*GRI Source Map ID 75456*).

Prominent text associated with this source:

Report

The full report from the source map is available here: Dry Tortugas (2010 Benthic Habitat).

GRI Digital Data Credits

This document was developed and completed by Ron Karpilo (Colorado State University) for the NPS Geologic Resources Division (GRD) Geologic Resources Inventory (GRI) Program. Quality control of this document by Jim Chappell (Colorado State University).

The information in this document was compiled from the GRI source map, and is intended to accompany the digital geologic-GIS maps and other digital data for Dry Tortugas National Park, Florida (DRTO) developed by Ron Karpilo and Jim Chappell (Colorado State University) (see the GRI Digital Maps and Source Map Citation section of this document for all sources used by the GRI in the completion of this document and related GRI digital geologic-GIS maps).

Special thanks to Rob Waara (National Park Service, Virgin Islands National Park) for providing us with guidance on Map Symbology, Map Interpretation and Benthic Habitat Unit Descriptions.

GRI finalization by Jim Chappell (Colorado State University).

Legacy data for this project was developed by Georgia Hybels and Stephanie O'Meara (Colorado State University)

GRI program coordination and scoping provided by Bruce Heise, Jason Kenworthy and Tim Connors (NPS GRD, Lakewood, Colorado).