Virginia Conservation Lands Needs Assessment
Virginia Recreation Model

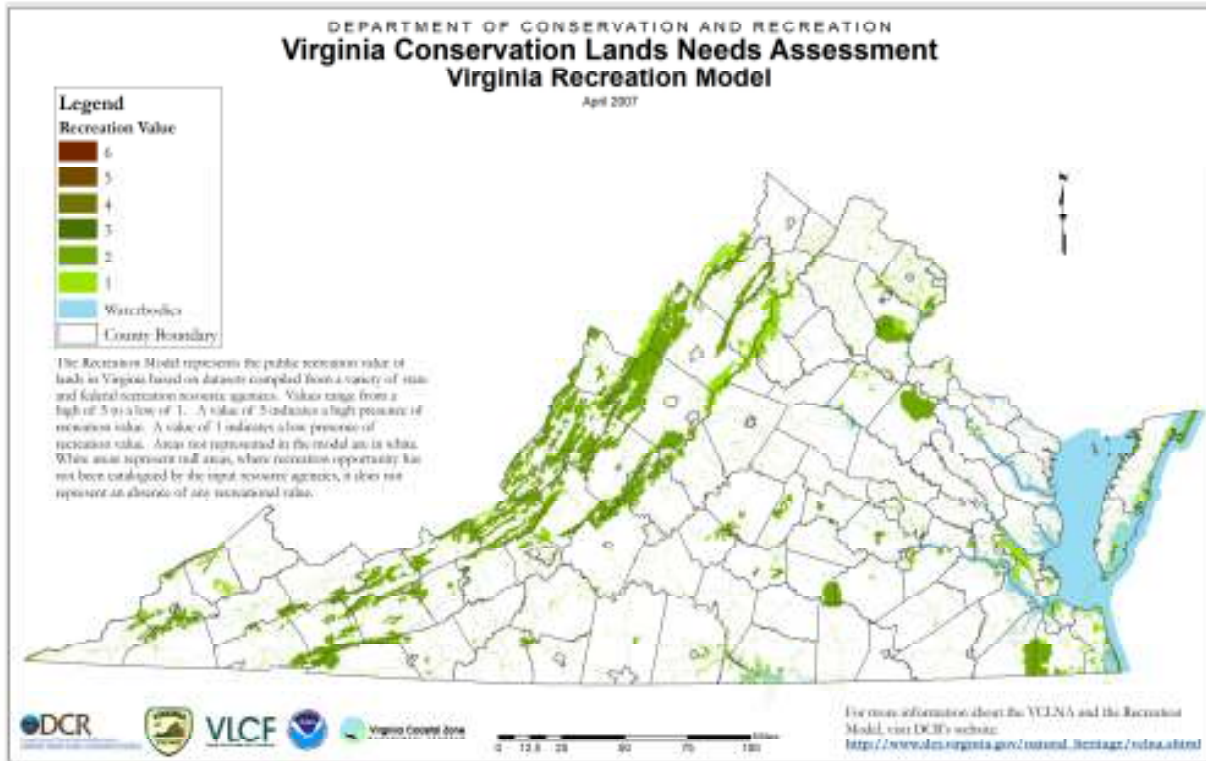DEPARTMENT OF CONSERVATION AND RECREATION
Virginia Conservation Lands Needs Assessment
Virginia Recreation Model
April 2007

Virginia Department of Conservation and Recreation Division of Natural Heritage
Virginia Department of Conservation and Recreation Division of Planning and Recreation
Resources
Virginia Department of Game and Inland Fisheries
Virginia DEQ Coastal Zone Management Program
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TABLE OF CONTENTS

INTRODUCTION

The Virginia Recreation Model was developed in an effort to map the existing public recreation lands in Virginia that are owned or managed by Federal, State, or Local Governments. As development pressure continues across the state, the need for natural resource based recreation areas will increase. The development of a GIS model to delineate where recreational opportunities currently exist may serve as a guide to local government, consultants, and developers in planning for and acquiring property for recreational use. The model also serves as part of a larger green infrastructure plan, which aims to model where Virginia's conservation priorities are located to facilitate an integrated approach to planning and development. For information on the Virginia Conservation Lands Needs Assessment and the Green Infrastructure Modeling effort, please visit the VCLNA website at
http://www.dcr.virginia.gov/natural_heritage/vclna.shtml.

The Virginia Department of Conservation and Recreation Division of Natural Heritage (DCR –DNH) partnered with the Department of Conservation and Recreation Division of Planning and Recreation Resources (DCR-PRR) and the Virginia Department of Game and Inland Fisheries (VADGIF) in the development of the Recreation Model model.

DCR PRR "provides policy and direction to the public and private sectors so they may better manage recreational resources, and outdoor and open spaces" (http://www.dcr.virginia.gov/recreational_planning/index.shtml). PRR provided guidance on recreation planning and trends and the "Virginia Outdoors Plan" (VOP) was used extensively as a reference in model development and analysis. For information on the Virginia Outdoors Plan, please contact the Virginia Department of Conservation and Recreation Division of Planning and Recreation Resources (http://www.dcr.virginia.gov/recreational_planning/index.shtml).

"The Virginia Department of Game and Inland Fisheries' mission is:

- to manage Virginia's wildlife and inland fish to maintain optimum populations of all species to serve the needs of the Commonwealth;

- to provide opportunity for all to enjoy wildlife, inland fish, boating and related outdoor recreation;

- to promote safety for persons and property in connection with boating, hunting and fishing."

    http://www.dgif.state.va.us/about/

VADGIF provided GIS data and input concerning consumptive recreational needs for Virginia. To request hunting and fishing data, please contact the Virginia Department of Game and Inland Fisheries (http://www.dgif.state.va.us).

The statewide Virginia Recreation model includes the following datasets:

- Public Beaches - The Virginia Outdoors Plan defines beach as a strip of sand or gravel along the shore separating land from water. Statewide beach inventory shows approximately 2047 acres of beach available for pubic access.

- Public Hunting Areas – Areas open to the public for hunting activities.

- Public Boating Access – Areas open to the public for boat launching. Some access points are boat ramps while others are canoe/kayak launches.

- Federal, State, and Local Parks.

- Managed Trails - trails managed by federal state or local entities that are open to the public.

- Virginia Scenic Byways – The Virginia Outdoors Plan describes Virginia Byways as state designated roadways that recognize the beauty and cultural legacy of the local region through which they pass.

- Virginia Birding and Wildlife Trails – VADGIF describes the VA Birding and Wildlife Trail System as the first statewide program of its kind in the United States. In Virginia, three phases of the trail link wildlife viewing sites throughout the state.

- Conserved Lands – State Natural Area Preserves, State Wildlife Management Areas, State Forests, Army Corps of Engineer Lands, National Forests, State and National Wildlife Refuges, Military Lands, Miscellaneous Government Lands contained in the DNH Conservation Lands Database (from DCR-DNH's conservation lands database see http://www.dcr.virginia.gov/natural_heritage/conslandmap.shtml).

- Water Resources – Navigable Waters, Scenic Rivers, Public Fishing Lakes, Trout Streams, Tidal Waters (as part of the Virginia Coastal Zone Management Program)

It is important the end user realize the recreation model represents existing publicly managed recreational lands in Virginia, and does not represent legal boundary delineations. The model serves to provide an overview of recreational opportunities throughout the Virginia landscape as defined by the absence / presence of publicly managed recreational properties.

Application of the Recreation Model

Some general categories of uses to which the recreation model can be applied include:

- Targeting – to identify areas of high recreational value.
- Prioritizing – to provide primary or additional justification for key conservation land purchases and other protection activities.
- Local planning – guidance for comprehensive planning and local ordinance and zoning development.
- Assessment – to determine if areas are lacking in recreational opportunities in relation to the surrounding population or projected population growth.

- Land Management – to guide public land managers in making land management decisions that enhance recreational opportunities.
- Public Education – to inform the citizenry about the recreational opportunities that exist in their community.

METHODOLOGY

Base Data

The Virginia Department of Game and Inland Fisheries provided shapefiles of: Public Fishing Lakes, Trout Streams, State Public Hunting Lands, State Wildlife Management Areas, and Public Boating Access, VA Birding and Wildlife Trails, and Non-Tidal Navigable Waters.

The Virginia Institute of Marine Science provided a shapefile of Public Beaches.

The Virginia Department of Conservation and Recreation Division of Natural Heritage provided shapefiles of: Conservation Lands, and Federal, State, and Local Parks. DCR-DNH also contributed shapefiles of Scenic Byways and Trails which were created with the assistance of DCR-PRR.

Methodological Steps

See Figure 14.

Collection of data began on December 11, 2006 and all data in the model is current to that date. All cartographic products are dated December 2006 reflecting the start date of the model. New data are continuously added to the parent datasets. For the most comprehensive and up to date GIS data, contact the responsible agency directly.

Each attribute in each layer of this model was given a value of "1" indicating the presence of a recreational data entity. Data were not weighted in the model based on functionality due to the lack of statewide data and the inherent subjectivity introduced by assigning value to one recreational activity over another. In areas where no data was present, a value of "0" was assigned indicating absence of data.

All shapefiles were reprojected to Lambert Conformal Conic NAD 1983.

Several of the polyline layers were buffered before being converted to grid. This was done to ensure a continuous line of data in polyline layers. A 15 meter buffer area to each side of the centerline was chosen because it is half a pixel in a 30m grid; the additional 15 meters would not introduce new area at a significant level to inaccurately represent the presence of data, but would ensure the appropriate pixels would represent the data.

Water features were buffered at 100ft (30.48m). The Chesapeake Bay Preservation Act defines the 100ft landward of a water body with a perennial flow as a resource protection area. In their natural condition, these lands provide for the removal, reduction or assimilation of sediments, nutrients and potentially harmful or toxic substances in runoff entering the bay and its tributaries, and minimize the adverse effects of human activities on state waters and aquatic resources. Additionally, these lands are important from a recreational standpoint because they provide scenic value as well as a potential means by which to access a water bodies.

Beaches

The beaches polyline layer was buffered 15m on either of the centerline using the buffer wizard tool in ArcMap. This resulted in a 30m buffer. This was done to ensure the

conversion to a 30m cell grid would result in a continuous line of data. This was not to add additional property to the area. After buffering, a grid value field was added to each attribute and a value of "1" was assigned. The layer converted to a 30m grid using ArcMap Spatial Analyst. After conversion, all null data was assigned a value of "0" using ArcGrid.

Hunting
A grid value field was added to each attribute and a value of "1" was assigned. The hunting layer was converted to a 30m grid using ArcMap Spatial Analyst. After conversion, all null data was assigned a value of "0" using ArcGrid.

Trails
The trails polyline layer from DNH was merged with a Wildlife Management trail layer from VADGIF.   The resulting trail shapefile was buffered 15m on either side of the centerline using ArcMap buffer wizard tool. Again, this was done to ensure a continuous line of data after conversion to a 30m grid using ArcMap spatial analyst. Next, a polygon shapefile of the Appalachian Trail Corridor lands was merged into the trail buffer layer. Each attribute was assigned a value of "1" and the layer converted to a 30m grid. After conversion, the null data was assigned a value of "0" using ArcGrid.

Conservation Lands and Parks

Conservation Lands
The conservation lands polygon layer was created by selecting out appropriate lands from the Virginia Conservation Lands Database maintained by DNH. These lands were chosen because they met the criteria of being managed by a federal, state, or local agency, and open to the public for recreational use. This selection was exported as to a shapefile. Each attribute was assigned a value of "1" and the data converted to a 30m grid using ArcMap Spatial Analyst. After conversion, the null data was assigned a value of "0" using ArcGrid.

Parks
The parks polygon layer was created by selecting out polygons with a managed area type of either a federal, state, or local park from the Virginia Conservation Lands Database maintained by DNH.   The parks layer intentionally omitted the Blue Ridge National Park because it was to be added to the scenic byways layer. Each attribute of the park layer was assigned a value of "1" and the data converted to a 30m grid using ArcMap Spatial Analyst. After conversion, the null data was assigned a value of "0" using ArcGrid.

The conservation grid and the parks grid were merged together using ArcGrid Gridmerge. This was done because conservation lands occasionally fall within park lands – i.e. National Parks Service wilderness area located within a national park. By merging the grids, additional value is not added to the conslands that fall within park lands. DNH and PRR agreed that there is no added value from a recreation standpoint for conservation lands falling within boundaries of park lands.

Virginia Wildlife and Birding Trails Layer and Scenic Byways Layer
Some scenic byways and VA birding and wildlife trails fall on the same roadway. Because the data were derived from different road sources, the data was not coincident. The summed grid of the two layers appeared irregular and misrepresented the

recreation value on the surface of the earth. To capture all roads that should be coincident, buffer analyses were run and each scenic byway that contained a birding trail was attributed with a value of "2". The remaining scenic byways were attributed with a value of "1". Birding trails that were not coincident with scenic byways were attributed with a value of "1".

Each trail was buffered at 15 meters and then converted to a grid with Spatial Analyst based on grid value assigned as described above. The two grids were merged using the ArcGrid Gridmerge command. This resulted in a final birding trail and scenic byway grid.

Water Layer

The Recreation Model aims to map land based recreation defined by model input parameters. A water layer was added to show the presence of water recreational opportunities.

The following data layers were buffered by 100ft: Scenic Rivers, Navigable Waters, Public Fishing Lakes, and Tidal Waters. These buffers were merged with a 100ft buffer of a trout stream layer that includes trout streams that lie on public lands. The data in the resulting layer was assigned a grid value of "1". The layer was converted to a 30 meter grid and null data was set to "0".

Combination of Recreation Input Parameters

After processing all layers, the resulting grids were added together using ArcGrid. The resulting final grid shows the sum of the number of present recreational opportunities. The summed recreational value is only calculated for the actual area the recreational opportunity exists (i.e. an entire park doesn't get an added value for having trails, only the actual trail corridor). The maximum realized value was "6".

Model Validation

The Recreation Model was quality controlled/assured through a visual assessment process. The USGS 3.75 minute quarter quadrangle was overlaid on top of the grid and original input data feature classes. The USGS grids were systematically assessed in ArcMap to visually check for the absence of data in the recreation grids in relation to presence of an original polygon in the original input feature classes. The final summed grid was validated the same way.

The final model was submitted to DCR DNH for an internal review, as well as the Department of Game and Inland Fisheries and DCR Division of Planning and Recreation Resources for review and comment.

Additional Analysis

Several analyses were conducted using data from this model. A travel time analysis was performed to show travel time to state parks with cabin facilities as well as travel time to DGIF boating access points and DGIF barrier free boating access points.

RESULTS

Maps were produced for the entire Coastal Zone and the Planning District Commissions (PDC) and are included as part of the final report. The report will be available online and on CD by request and include:

- Maps showing:
    - Recreation value of land
    - Individual PDC maps
- A detailed report.

- Metadata

- Personal geodatabase and shapefiles

DISCUSSION

The Recreation Model may serve as a guide to state and local government, consultants, and developers as to the location of important recreation resources. The model can be used alone or integrated with other datasets, such as the VCLNA Vulnerability Model (growth prediction model) or Ecological Model, to identify which recreation resources are most at risk to growth pressures or would serve to contribute to an ecological core area.

The model may also be used to help guide local land use planners in the development of their comprehensive plans. It is important to look at the landscape as a whole and assess how growth may impact the need for additional recreation resources and where to focus acquisition efforts.

The models serve as part of a larger green infrastructure plan, which aims to model where Virginia's conservation priorities are located to facilitate an integrated approach to planning and development. For information on the Virginia Conservation Lands Needs Assessment and the Green Infrastructure Modeling effort, please visit the VCLNA website at http://www.dcr.virginia.gov/natural_heritage/vclna.shtml

FUTURE APPLICATIONS

Additional Data Incorporation

Development of a statewide model constrains the model to statewide available datasets. In the future, particular areas can be appended to with additional information specific to that area, such as newly acquired local parks or boating access points.

View shed Analysis
Areas that surround recreation land may support the value of such lands through aesthetic qualities, such as viewsheds from trails. The development of viewsheds for a particular site will provide a delineation of lands that act to support recreation value.

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Accessed April – May 2007.

Figure 1. Recreation Model Methodology.
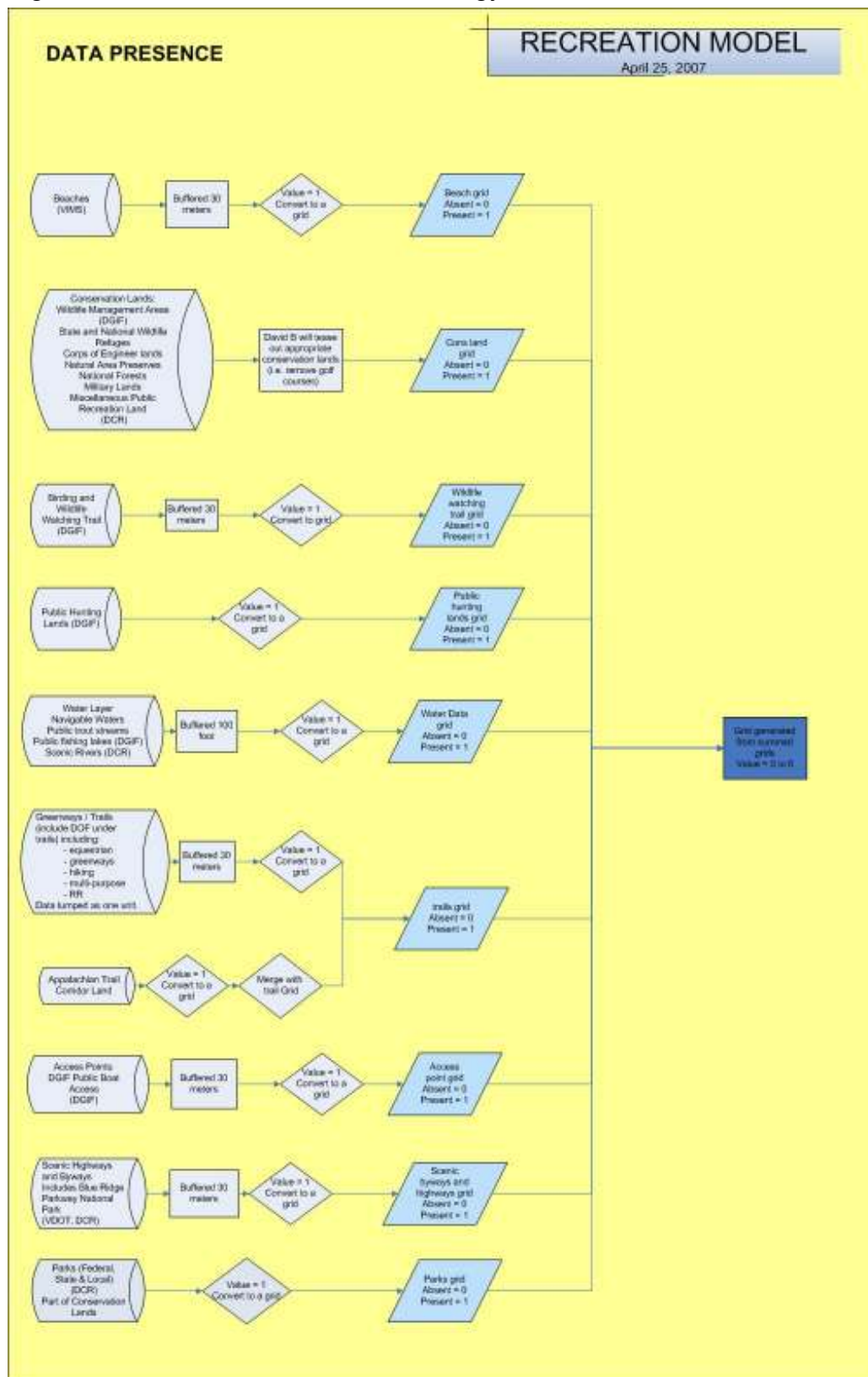
Figure 2. PDC 1 LENOWISCO Recreation Model.
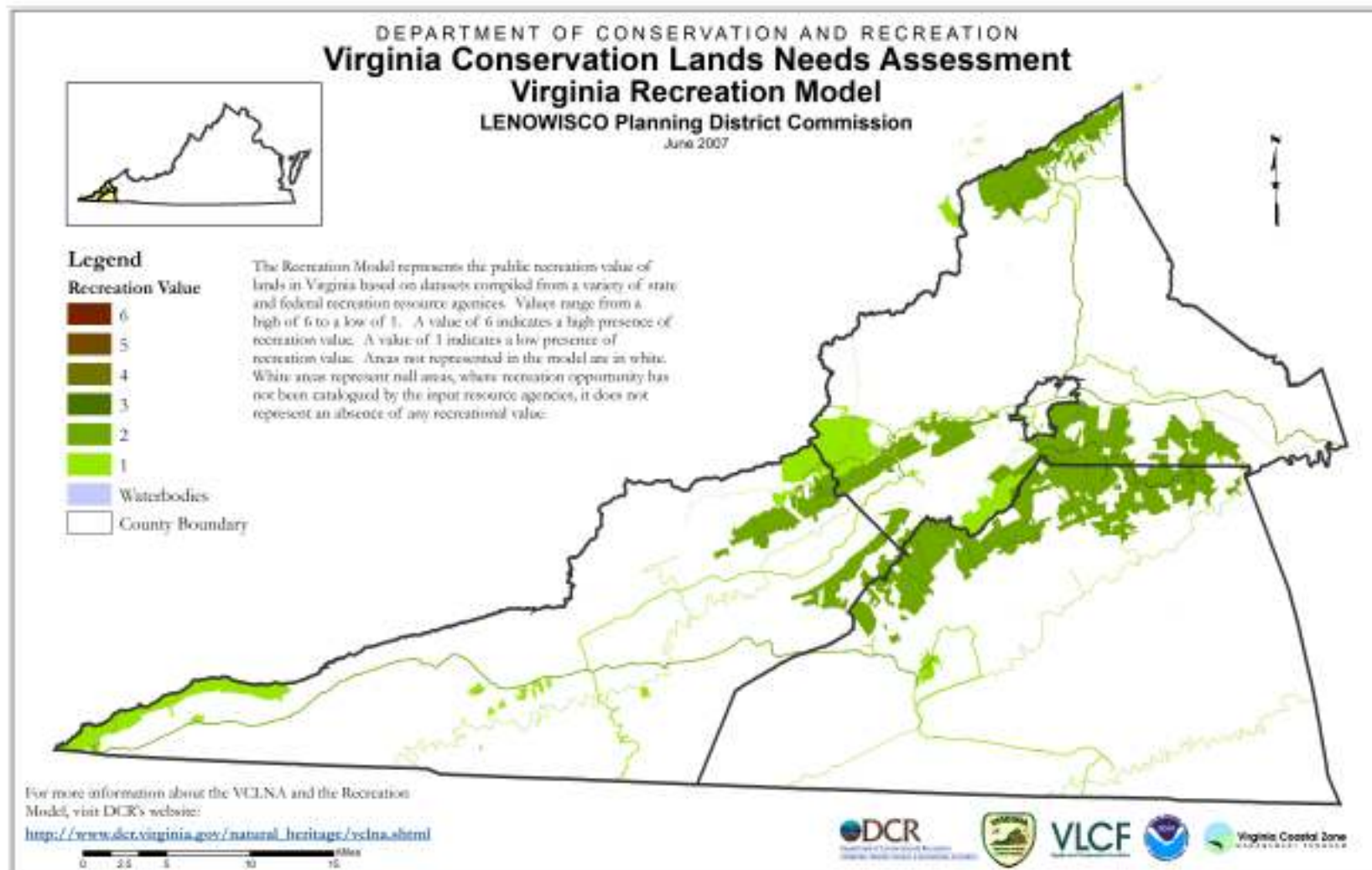
Figure 3. PDC 2 Cumberland Plateau Recreation Model.
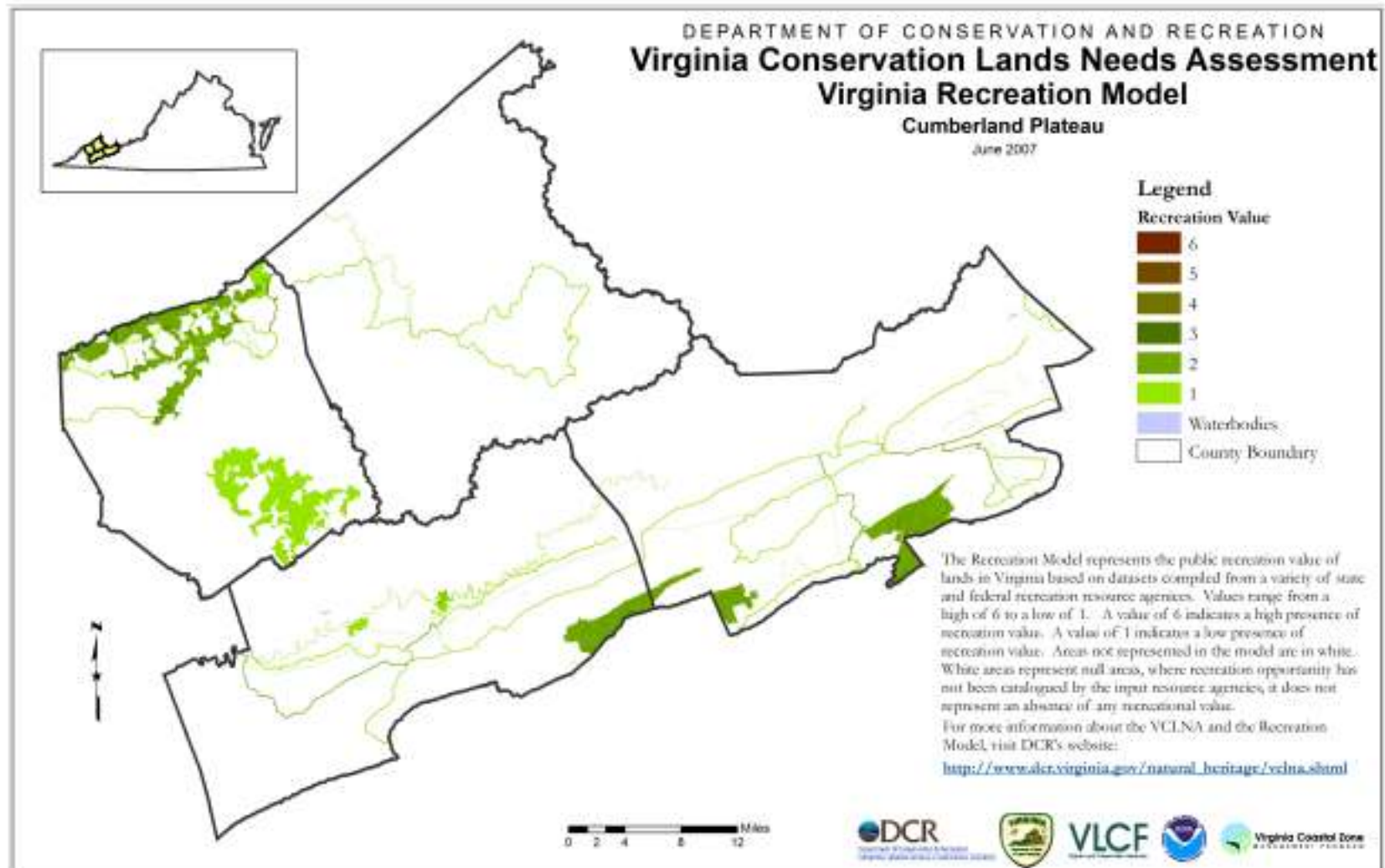
Figure 4. PDC 3 Mount Rogers Recreation Model
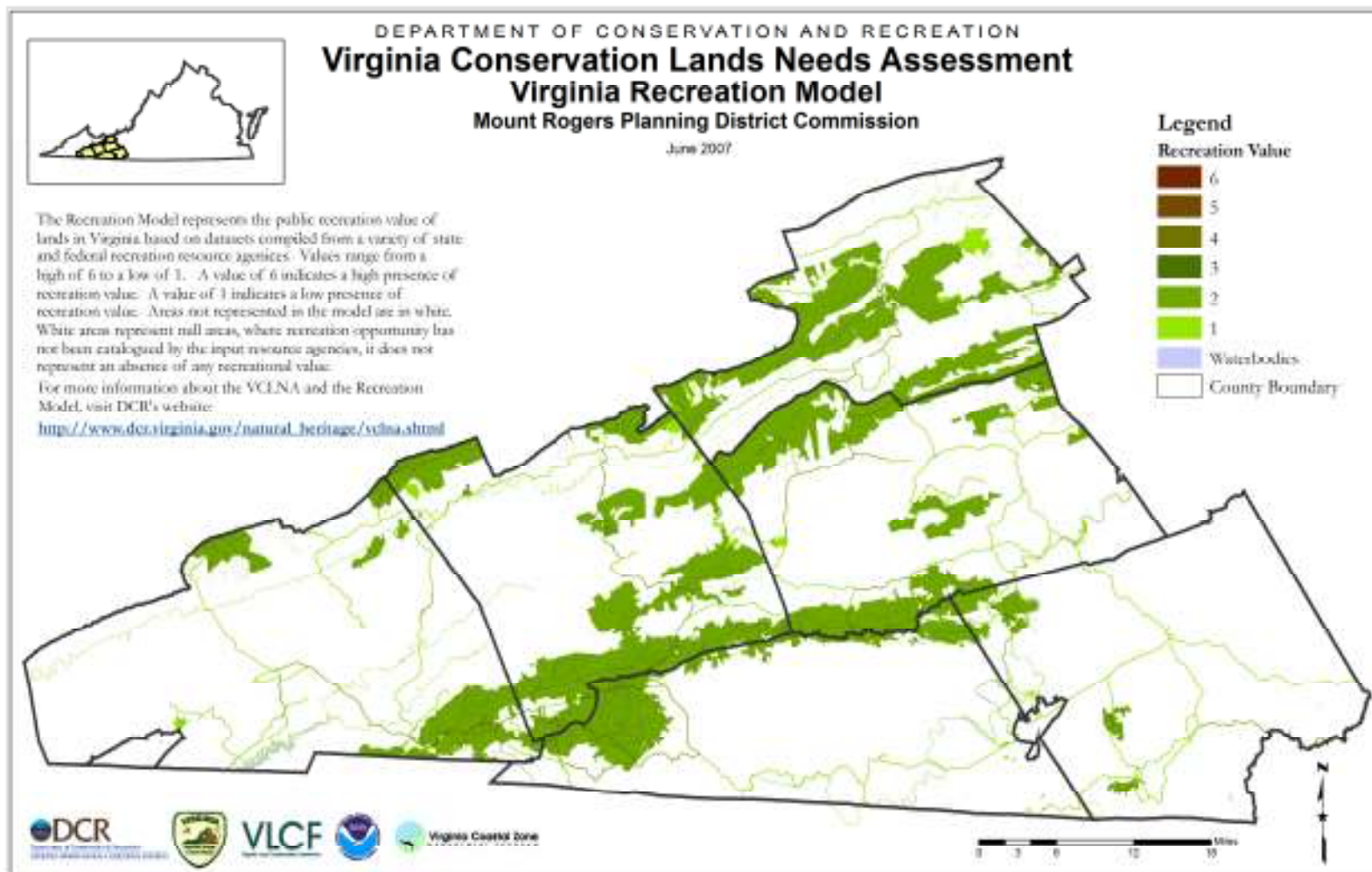
Figure 5. PDC 4 New River Valley Recreation Model.
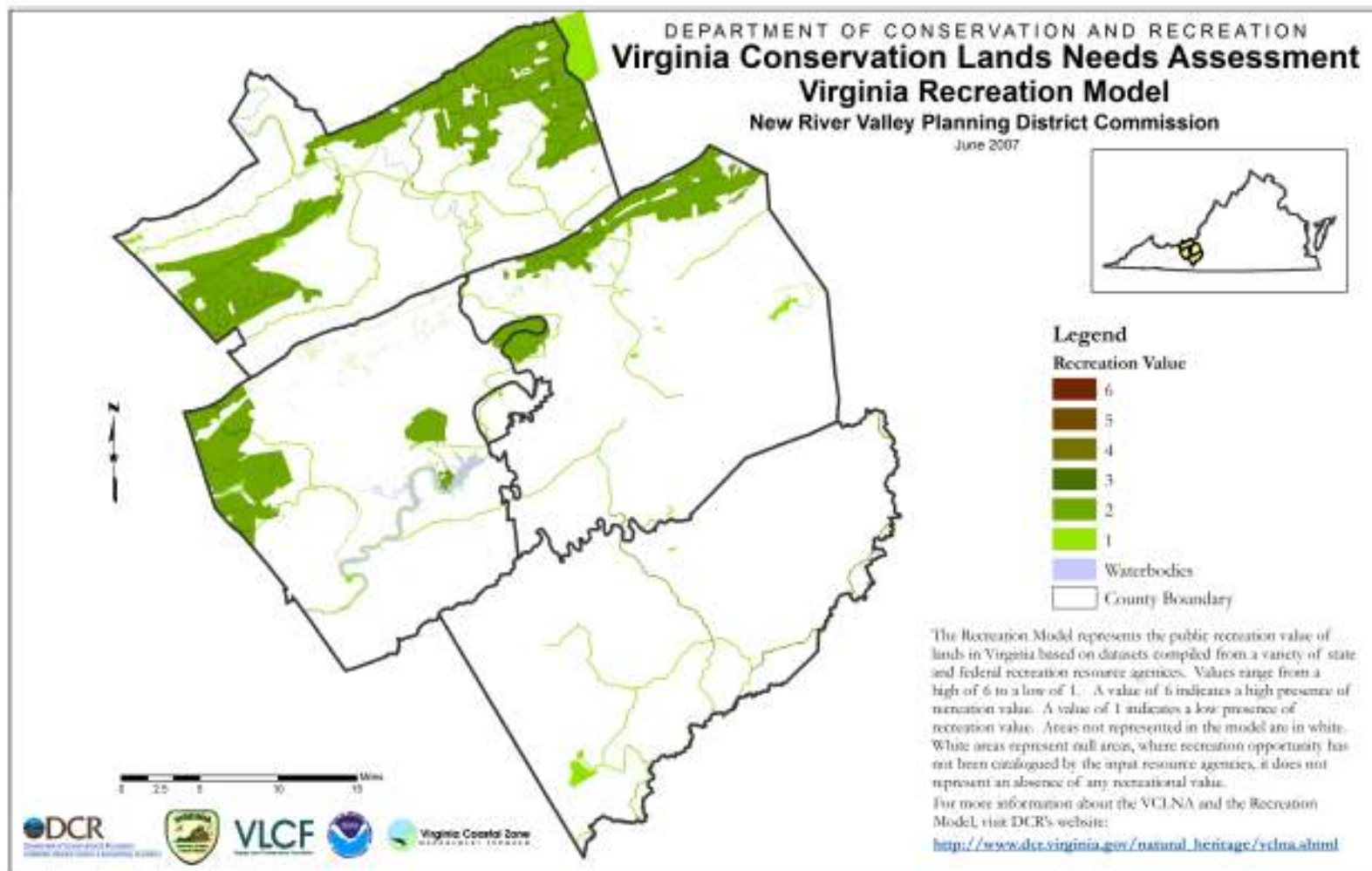
Figure 6. PDC 5 Roanoke Valley-Alleghany Regional Commission Recreation Model.
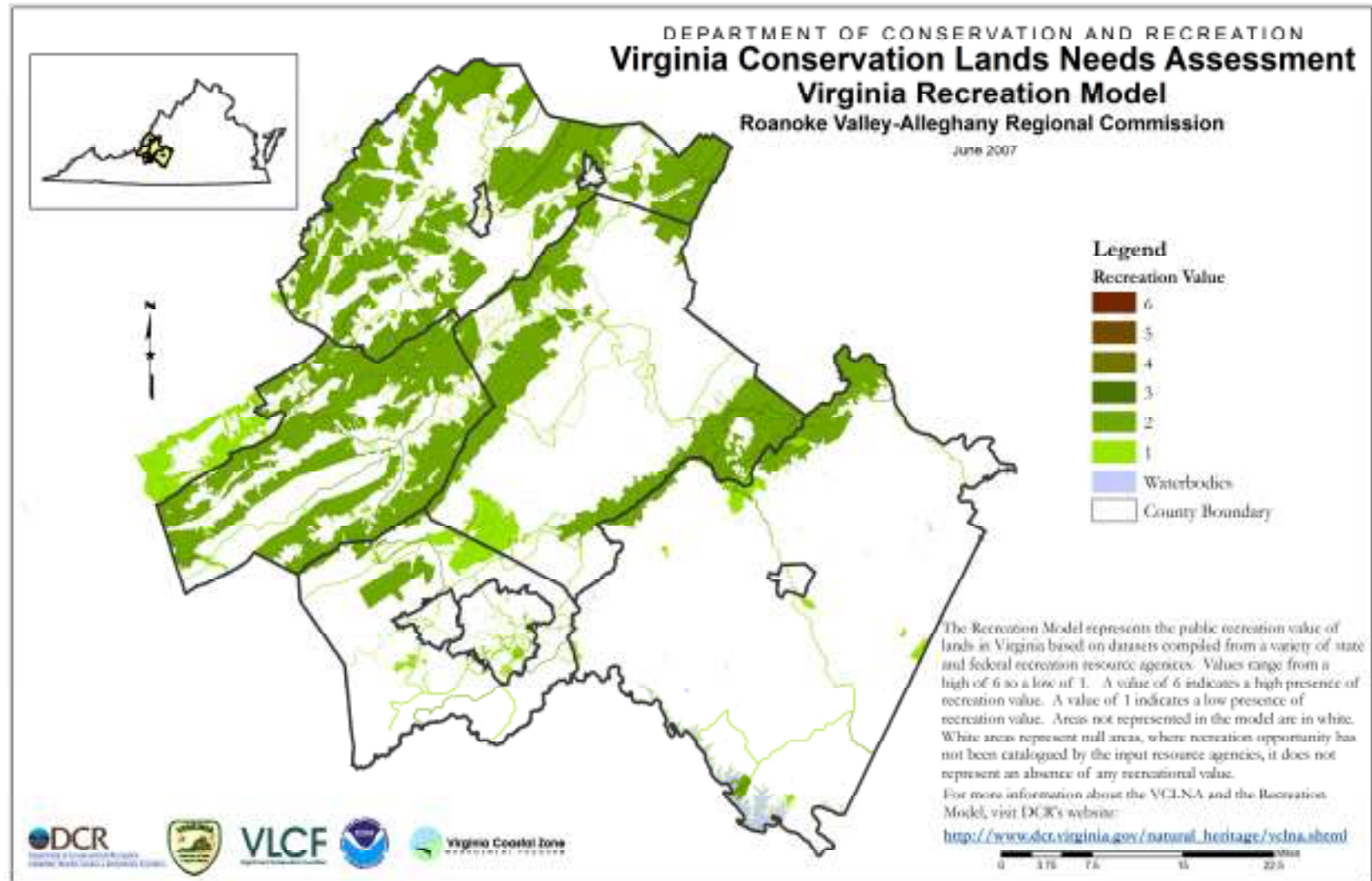
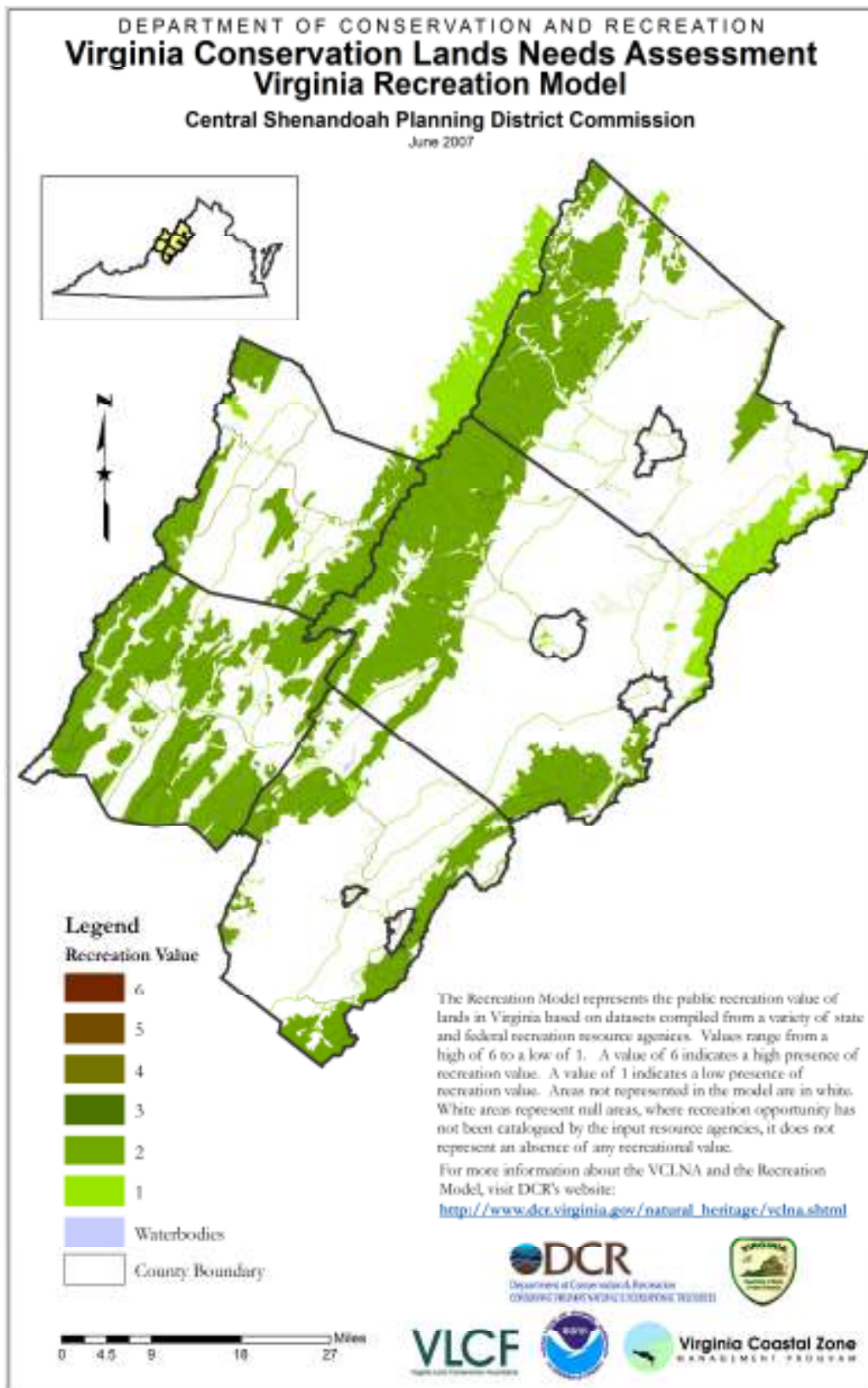Figure 7. PDC 6 Central Shenandoah Recreation Model.

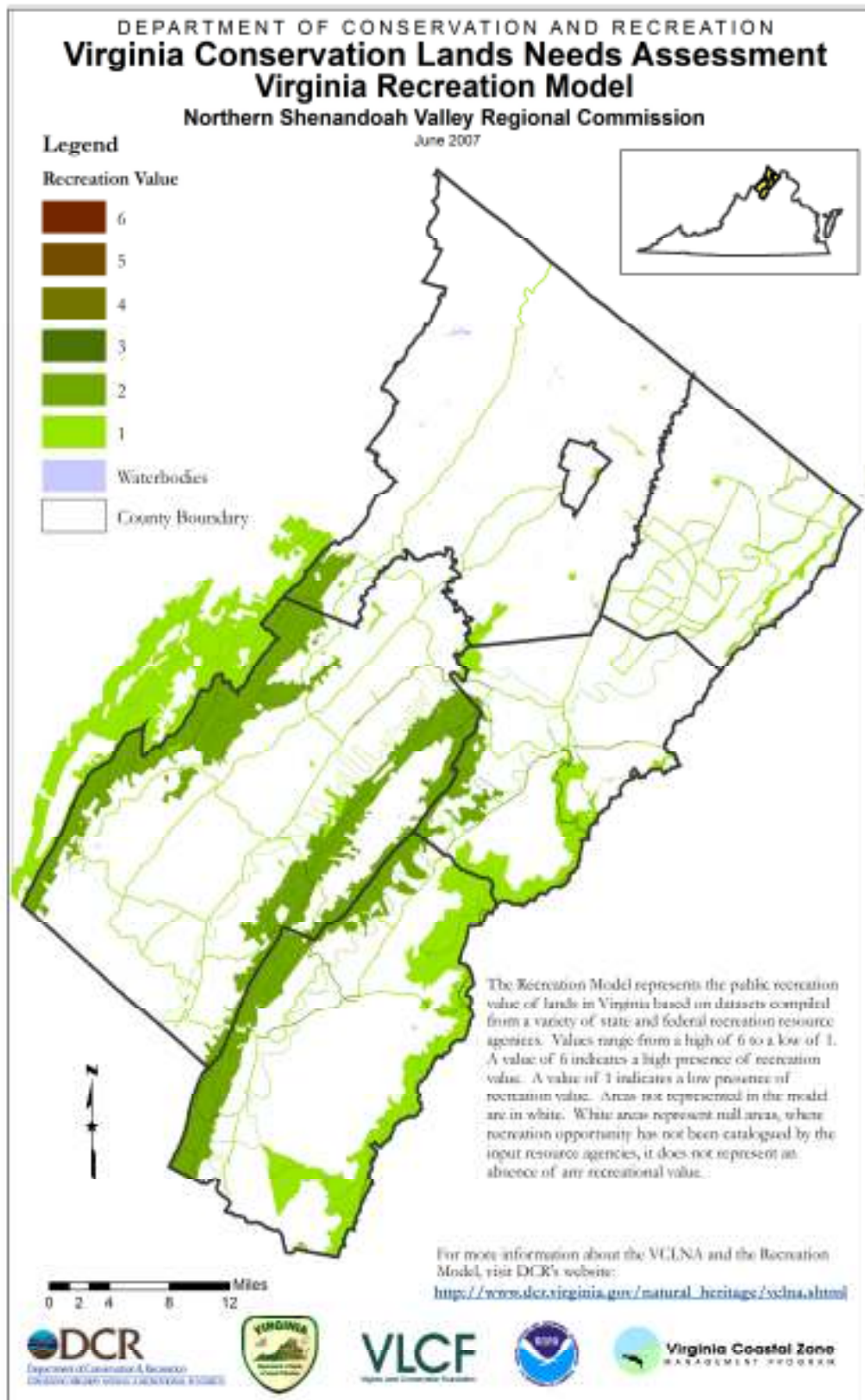Figure 8. PDC 7 Northern Shenandoah Regional Commission Recreation Model.

Figure 9. PDC 8 Northern Virginia Regional Commission Recreation Model.
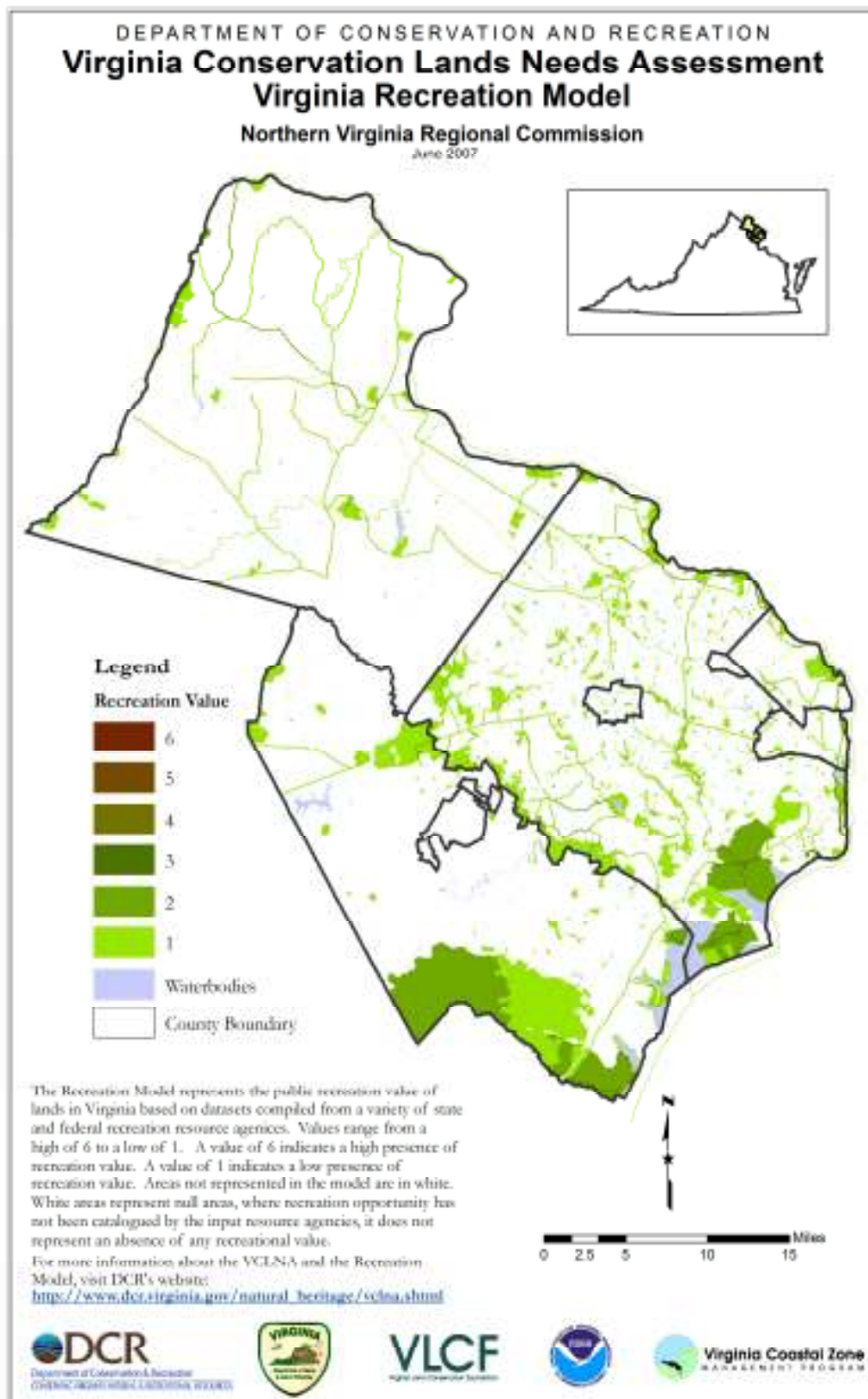
Figure 10. PDC 9 Rappahannock-Rapidan Regional Commission Recreation Model.
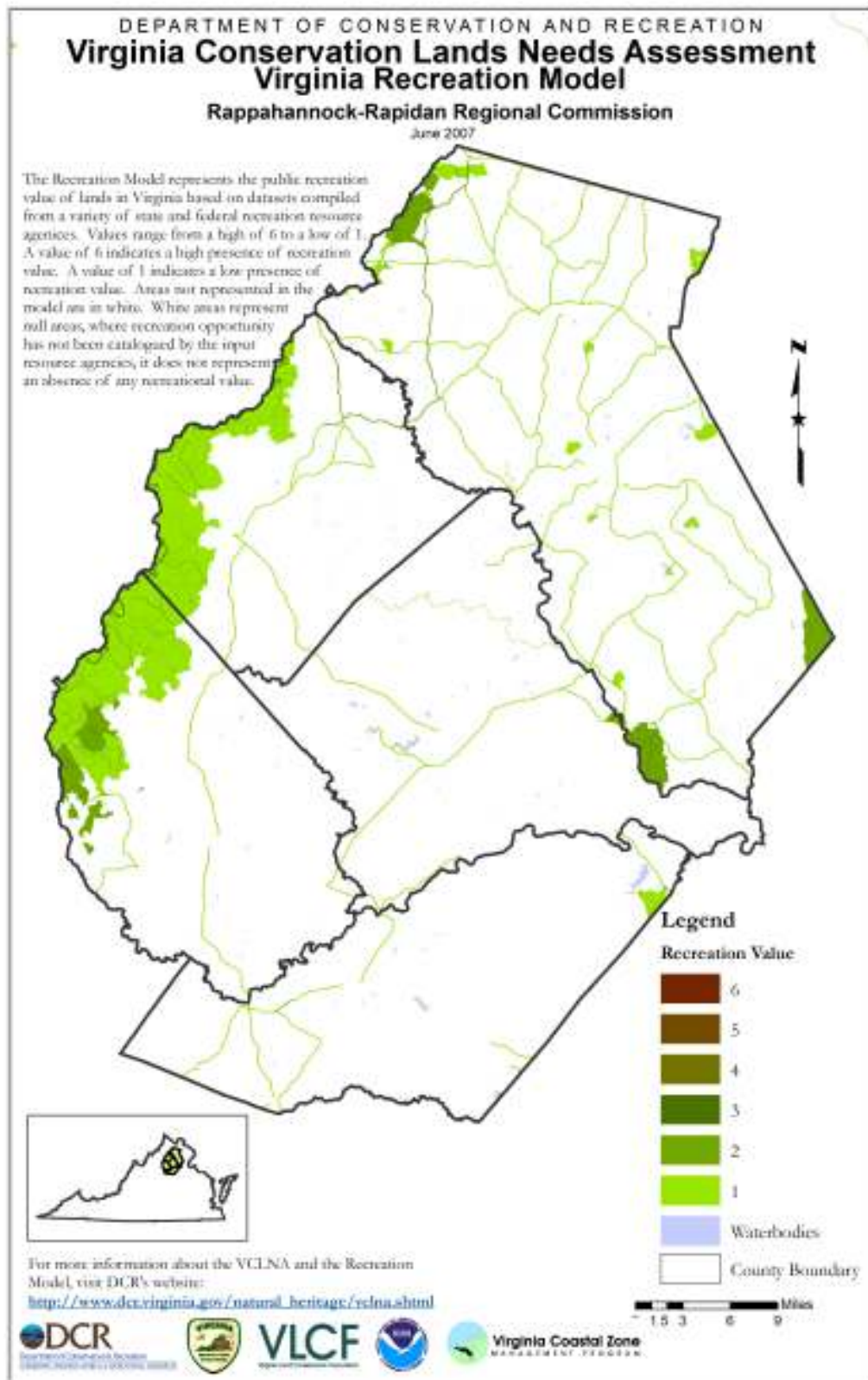
Figure 11. PDC 10 Thomas Jefferson Recreation Model.
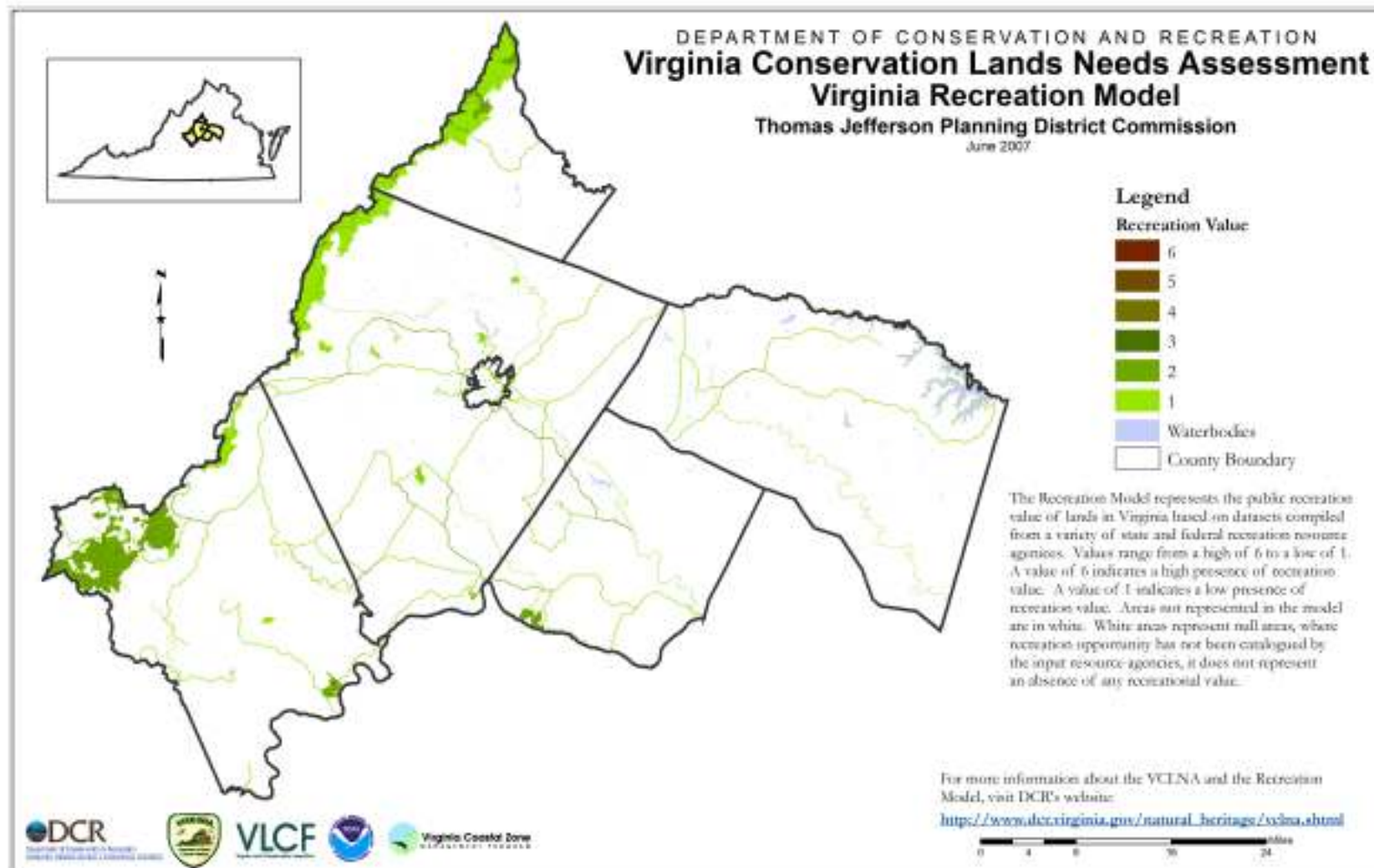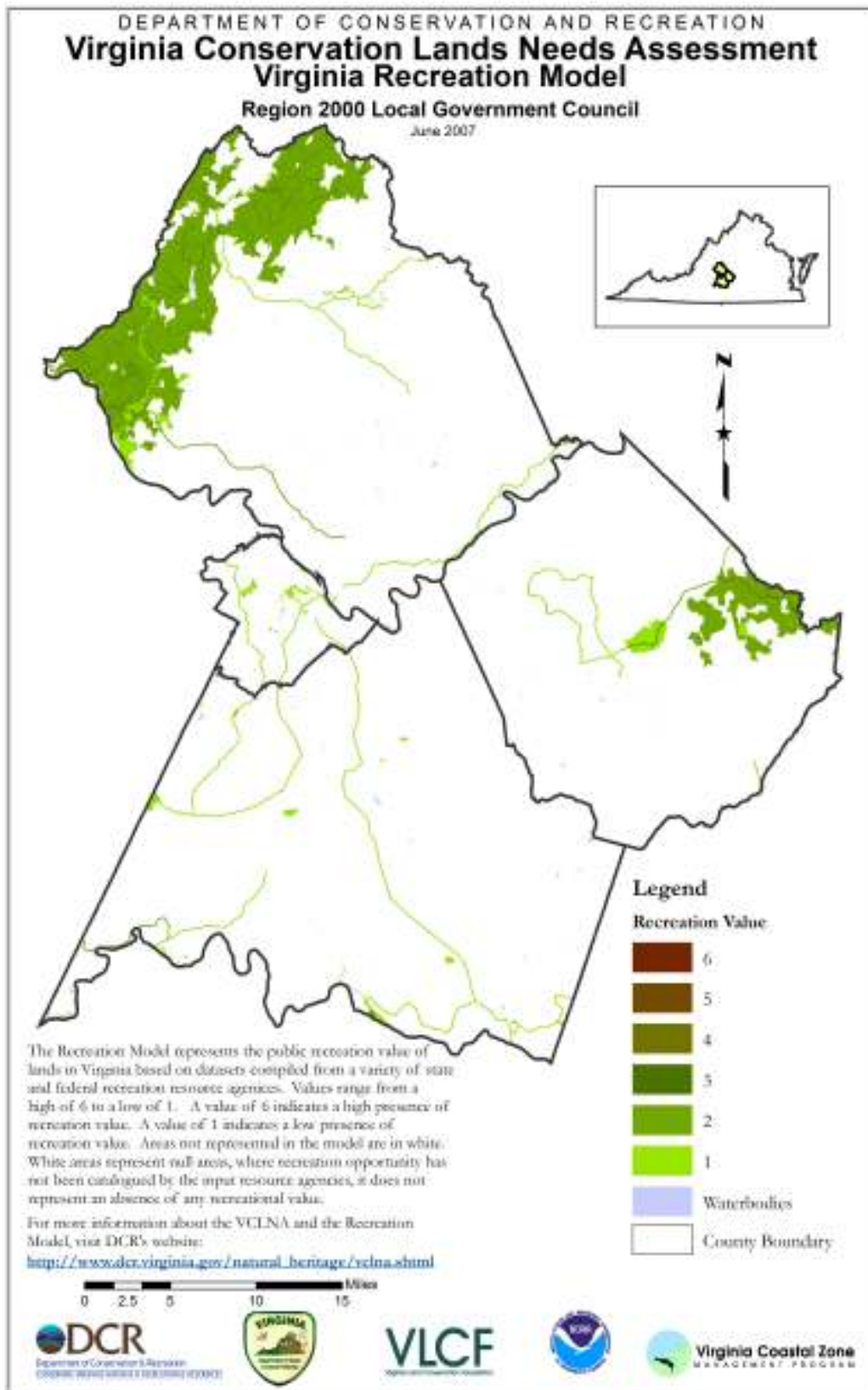
Figure 12. PDC 11 Region 2000 Local Government Council Recreation Model.
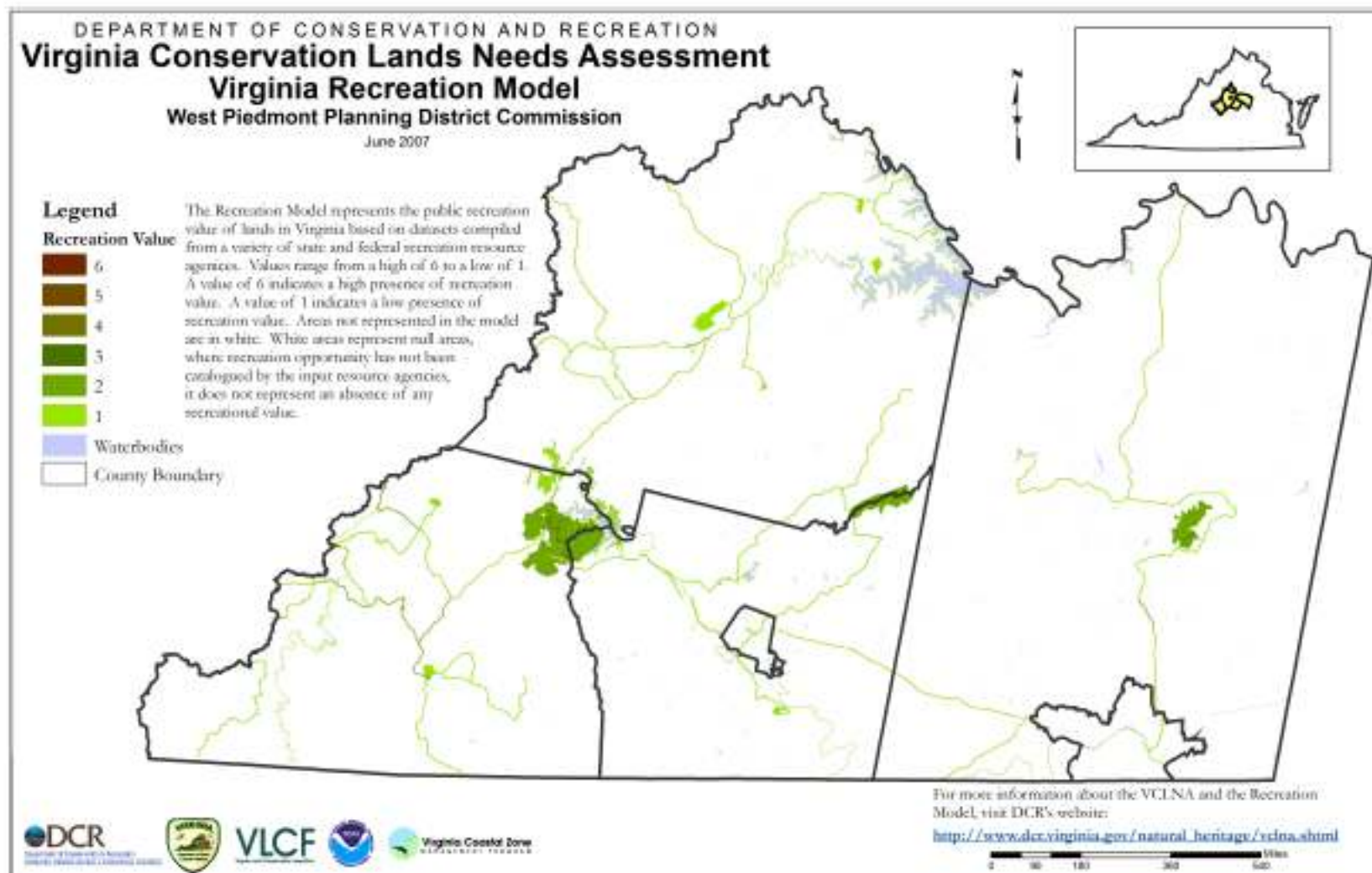
Figure 13. PDC 12 West Piedmont Recreation Model.

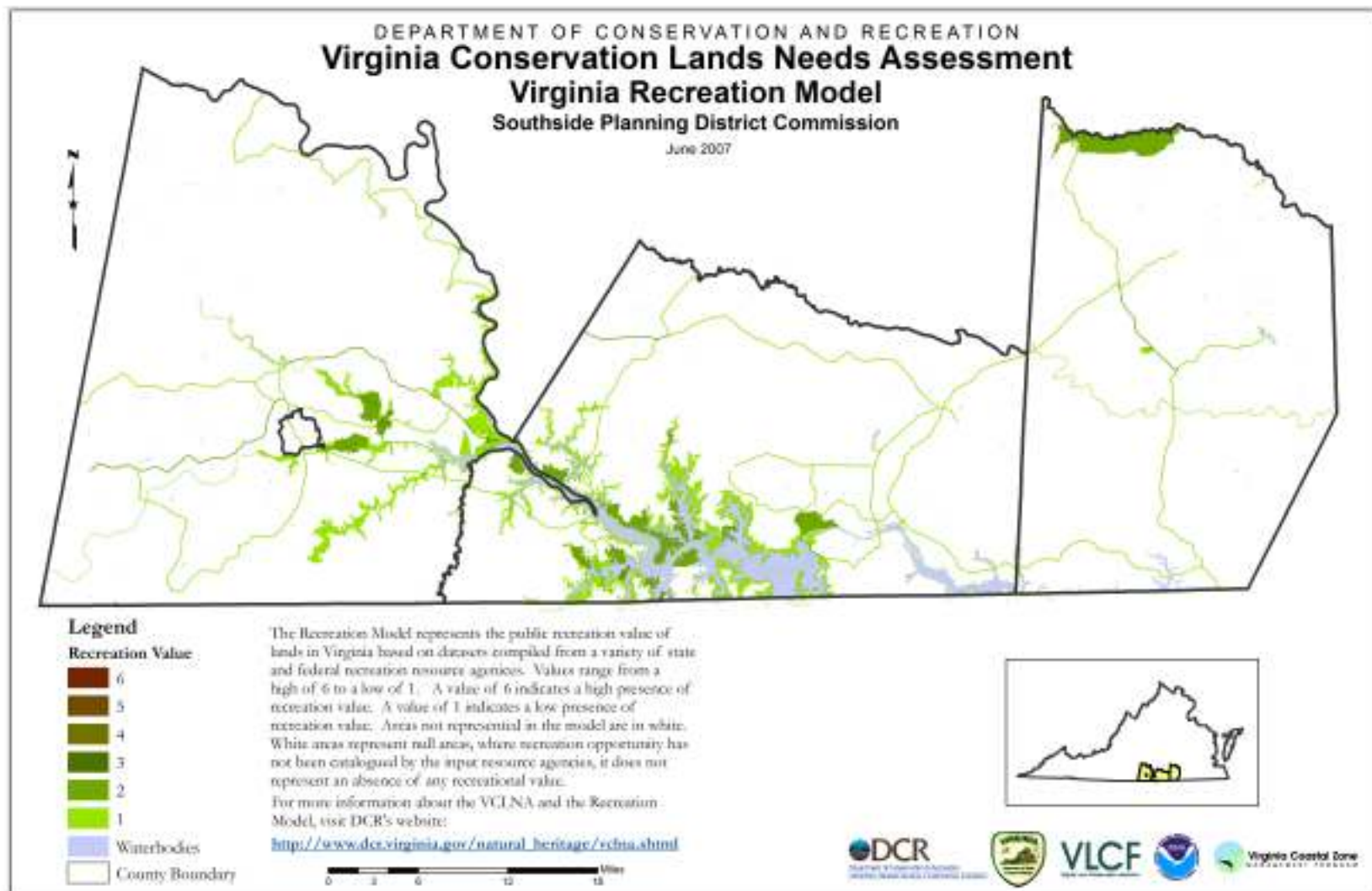Figure 14. PDC 13 Southside Recreation Model.

Figure 15. PDC 14 Commonwealth Regional Council Recreation Model.
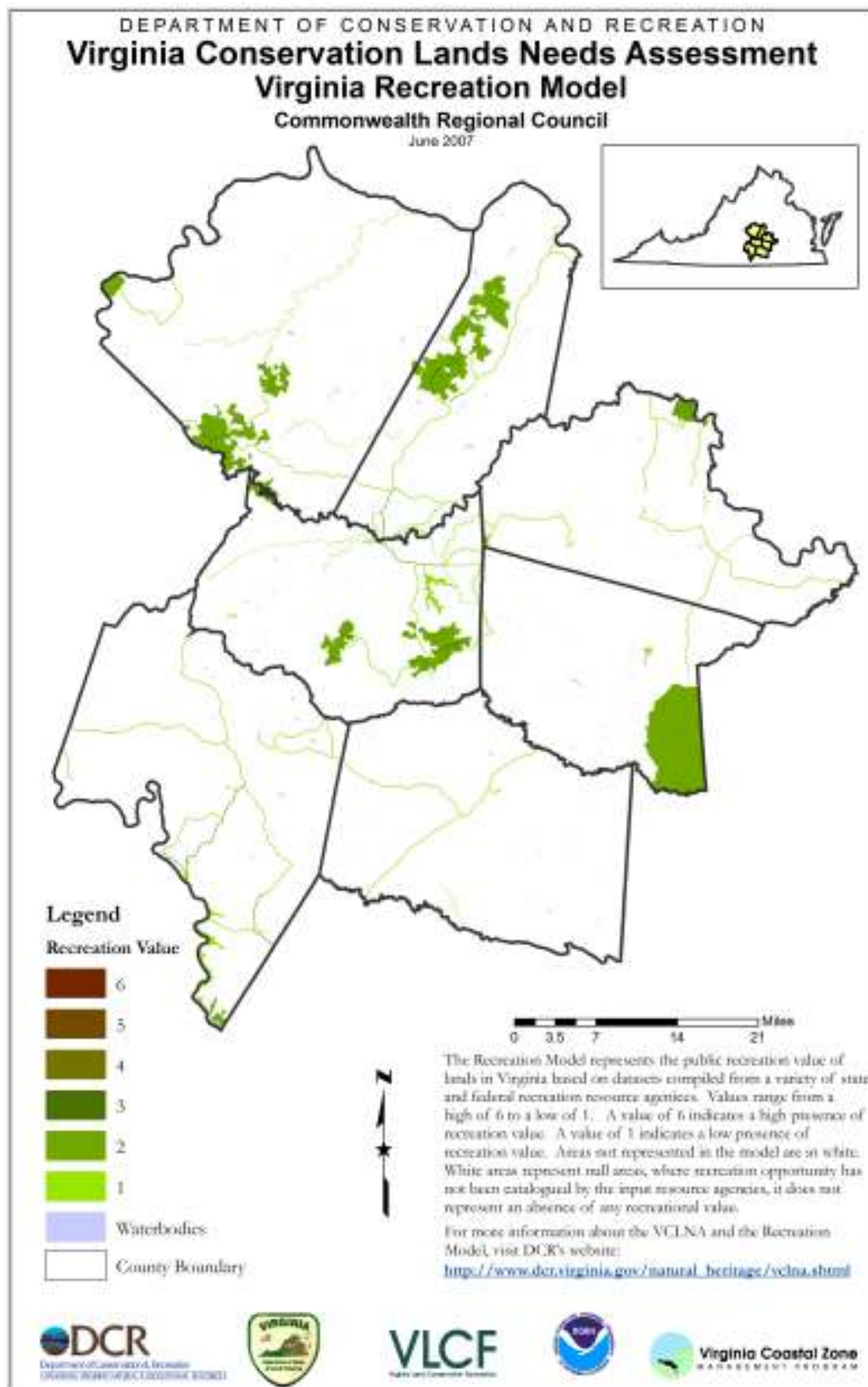
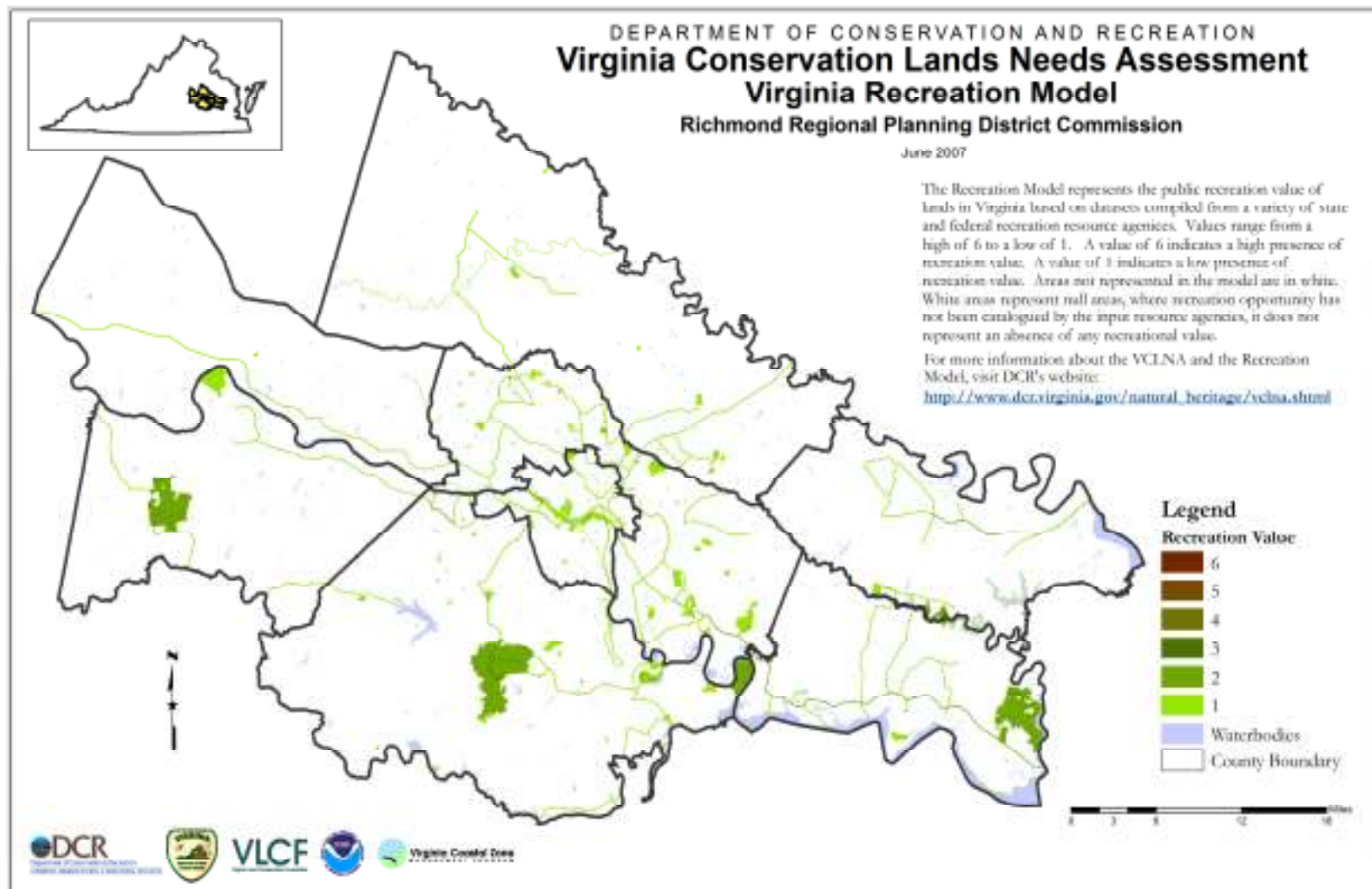Figure 16. PDC 15 Richmond Regional Recreation Model.

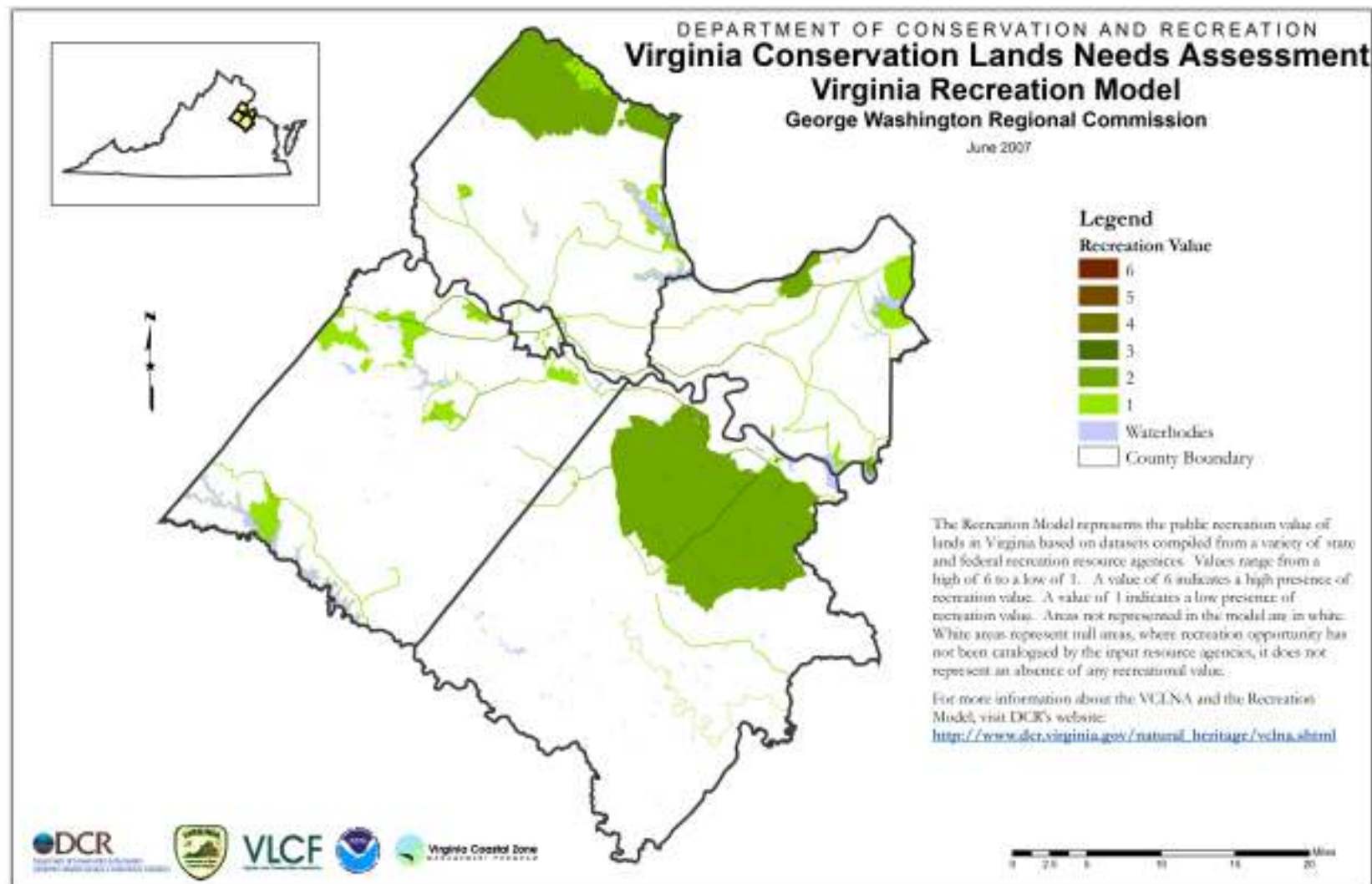Figure 17. PDC 16 George Washington Regional Commission Recreation Model.

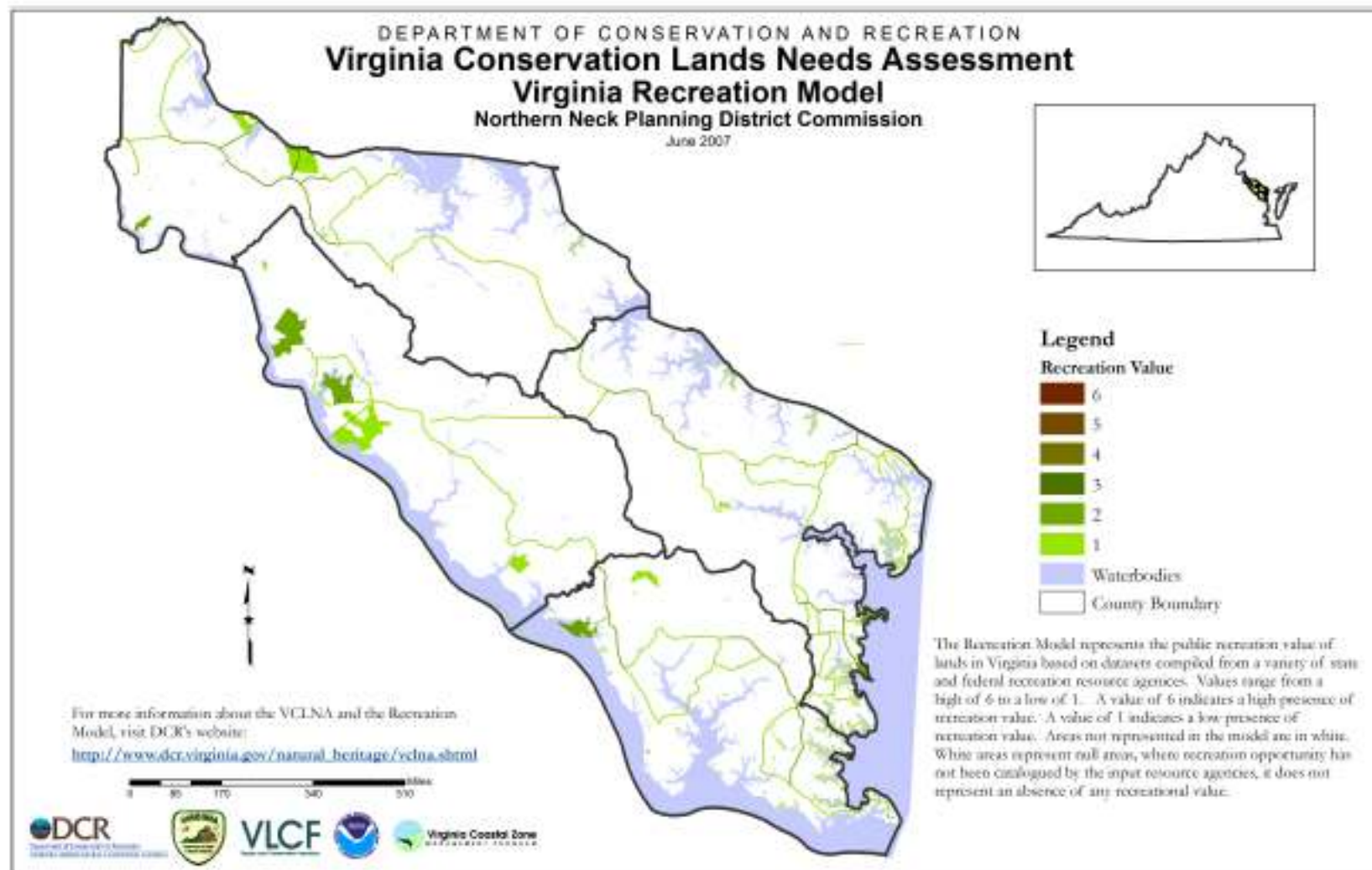Figure 18. PDC 17 Northern Neck Recreation Model.

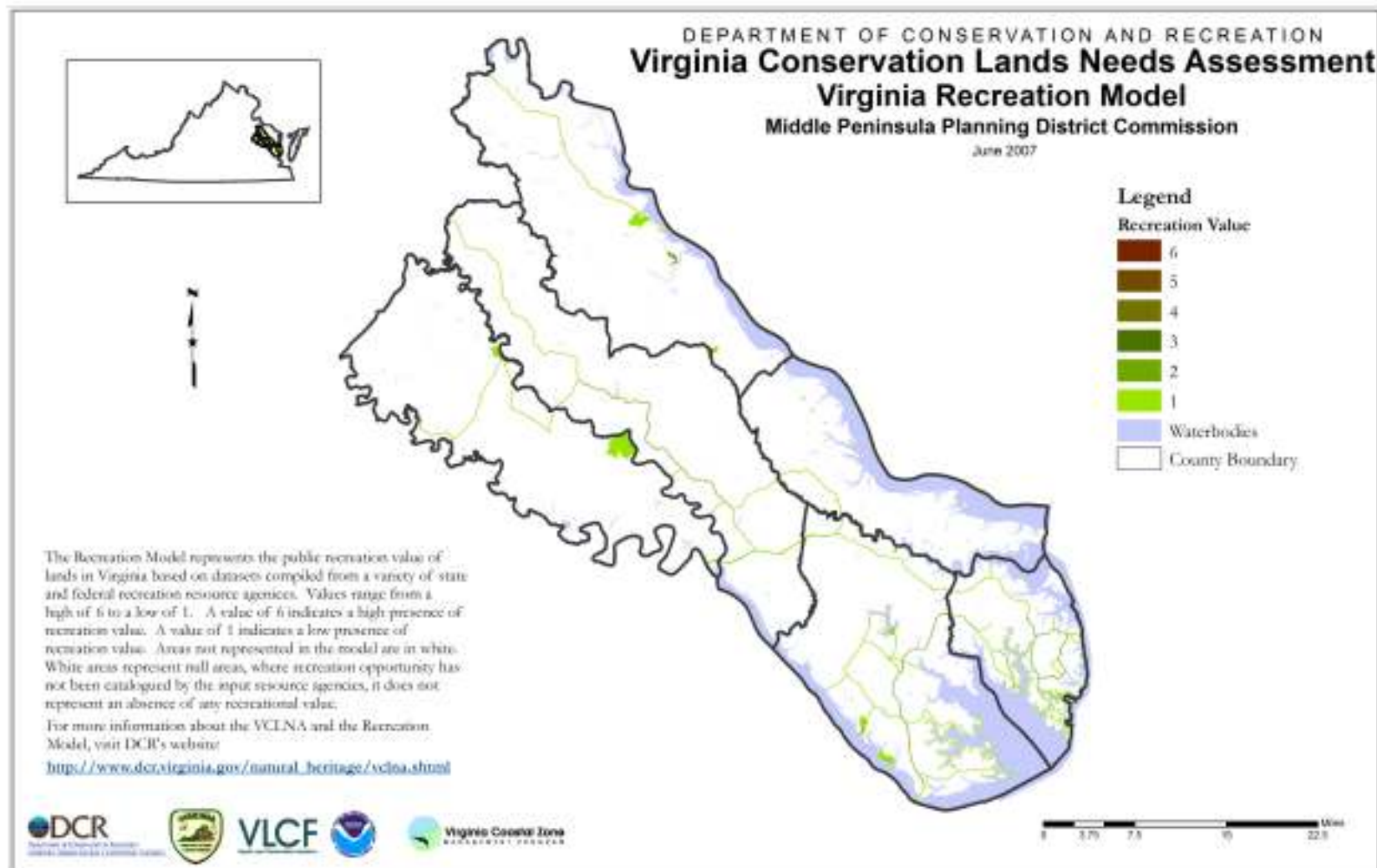Figure 19. PDC 18 Middle Peninsula Recreation Model.
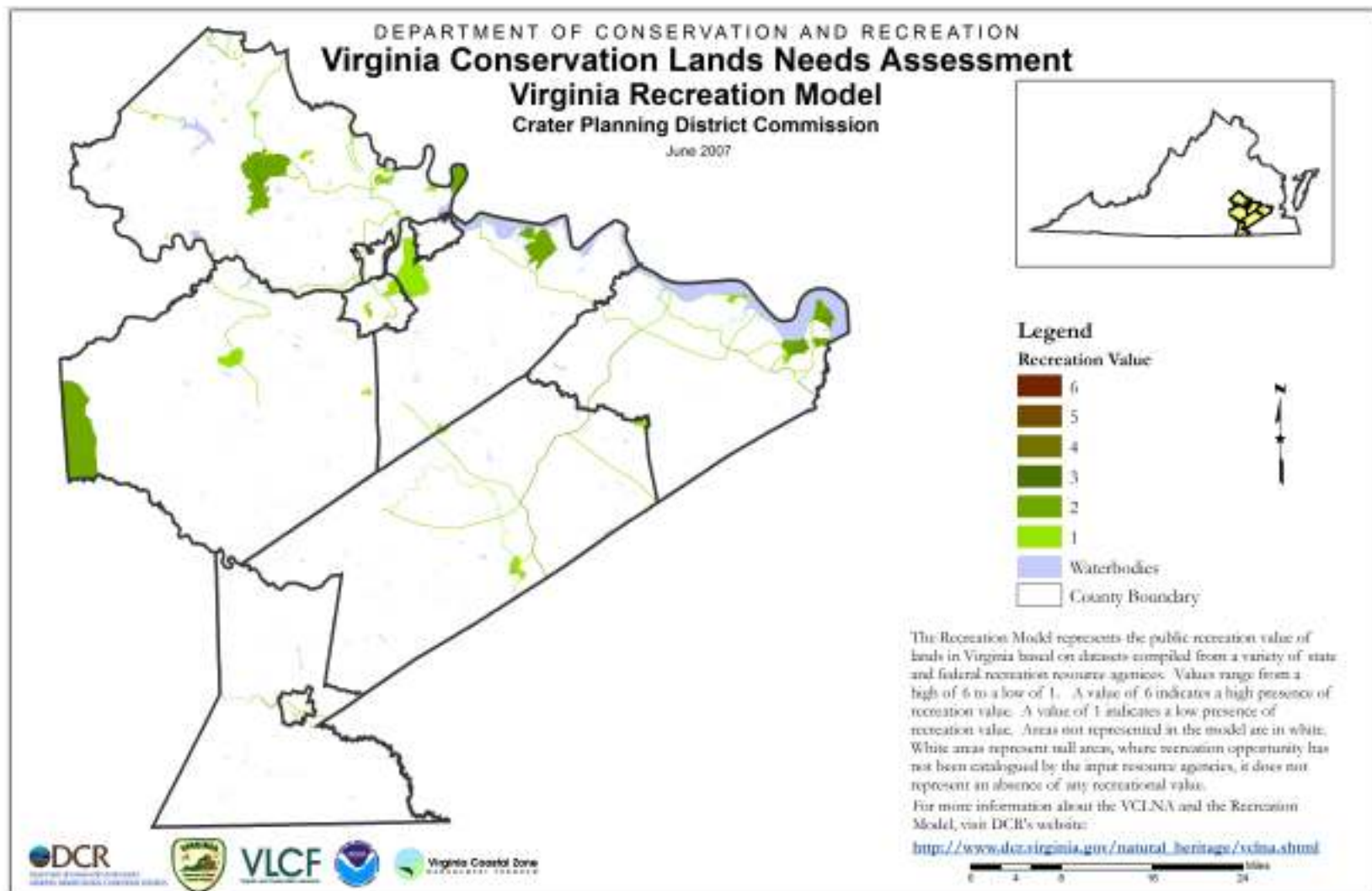
Figure 20. PDC 19 Crater Recreation Model.

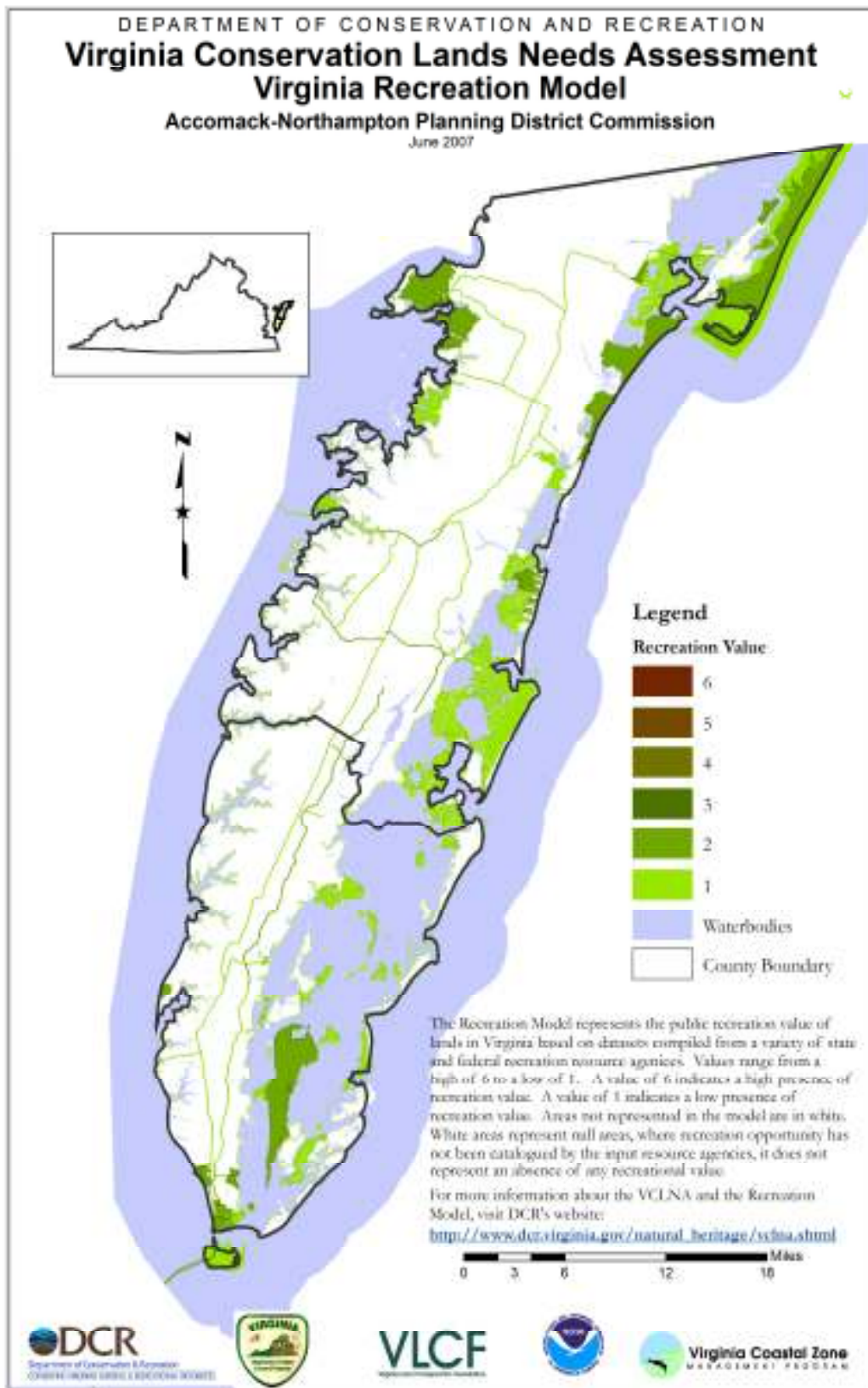Figure 21. PDC 22 Accomack-Northampton Recreation Model.

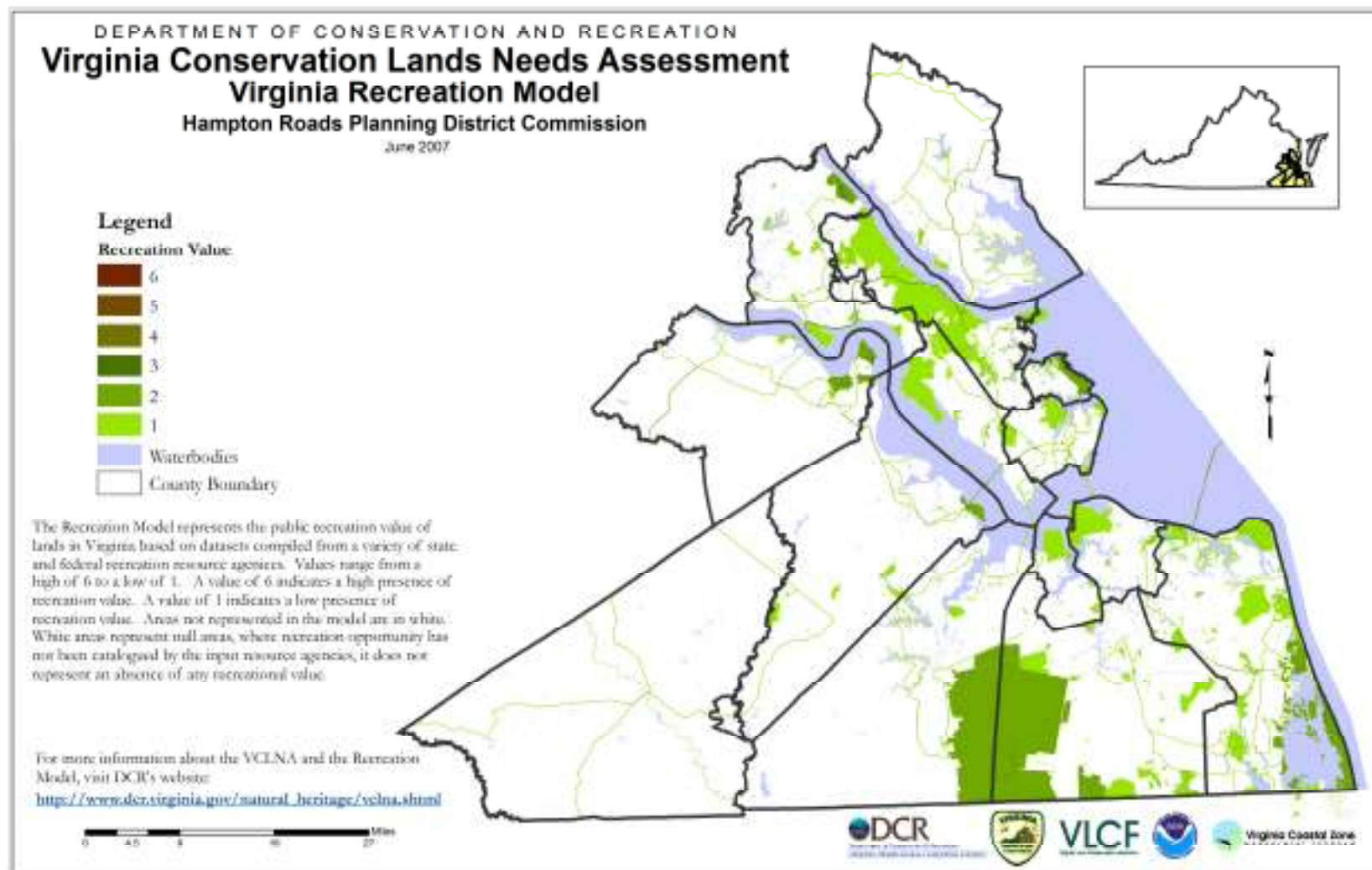Figure 22. PDC 23 Hampton Roads Recreation Model.

Figure 23. Virginia Coastal Zone Recreation Model.

DEPARTMENT OF CONSERVATION AND RECREATION
Virginia Conservation Lands Needs Assessment
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Legend
Recreation Value
6
5
4
3
2
1
Waterbodies
County Boundary

Miles
0 5 10   20   30

The Recreation Model represents the public recreation value of lands in Virginia based on datasets compiled from a variety of state and federal recreation resource agencies. Values range from a high of 6 to a low of 1. A value of 6 indicates a high presence of recreation value. A value of 1 indicates a low presence of recreation value. Areas not represented in the model are in white. White areas represent null areas, where recreation opportunity has not been catalogued by the input resource agencies; it does not represent an absence of any recreational value.

For more information about the VCLNA and the Recreation Model, visit DCR's website:
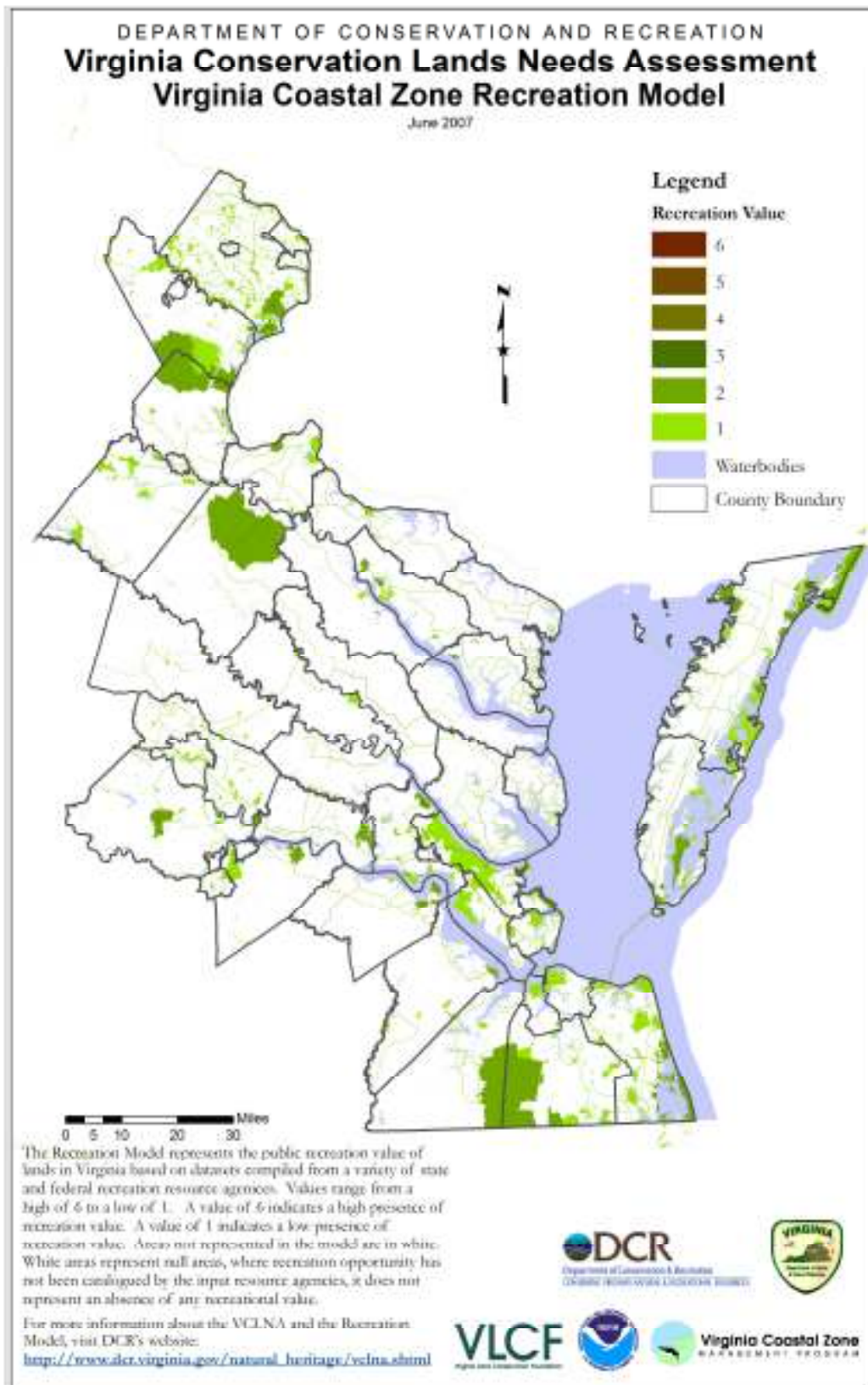http://www.dcr.virginia.gov/natural_heritage/vclna.shtml

DCR
VLCF
Virginia Coastal Zone

Figure 24. Statewide Recreation Model.