

The Geology of the Laurelwood Arboretum and Nearby Region

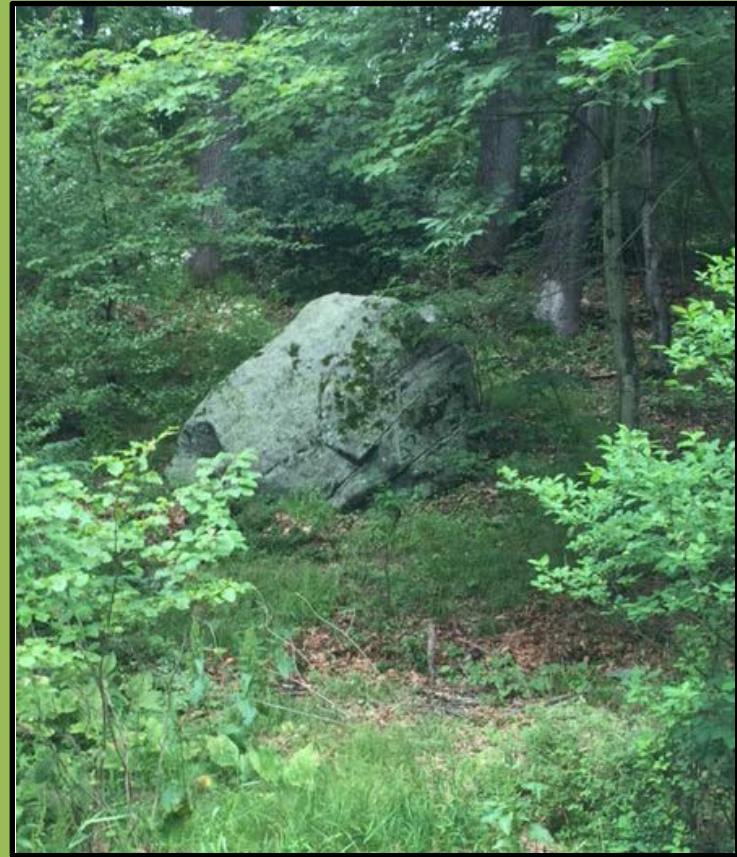
Dr. Marty Becker

**Department of
Environmental
Science**

**William Paterson
University**

Wayne, NJ 07470

beckerm2@wpunj.edu



Large **Gneiss** glacial erratic between Brook and Ridge Roads, Laurelwood Arboretum

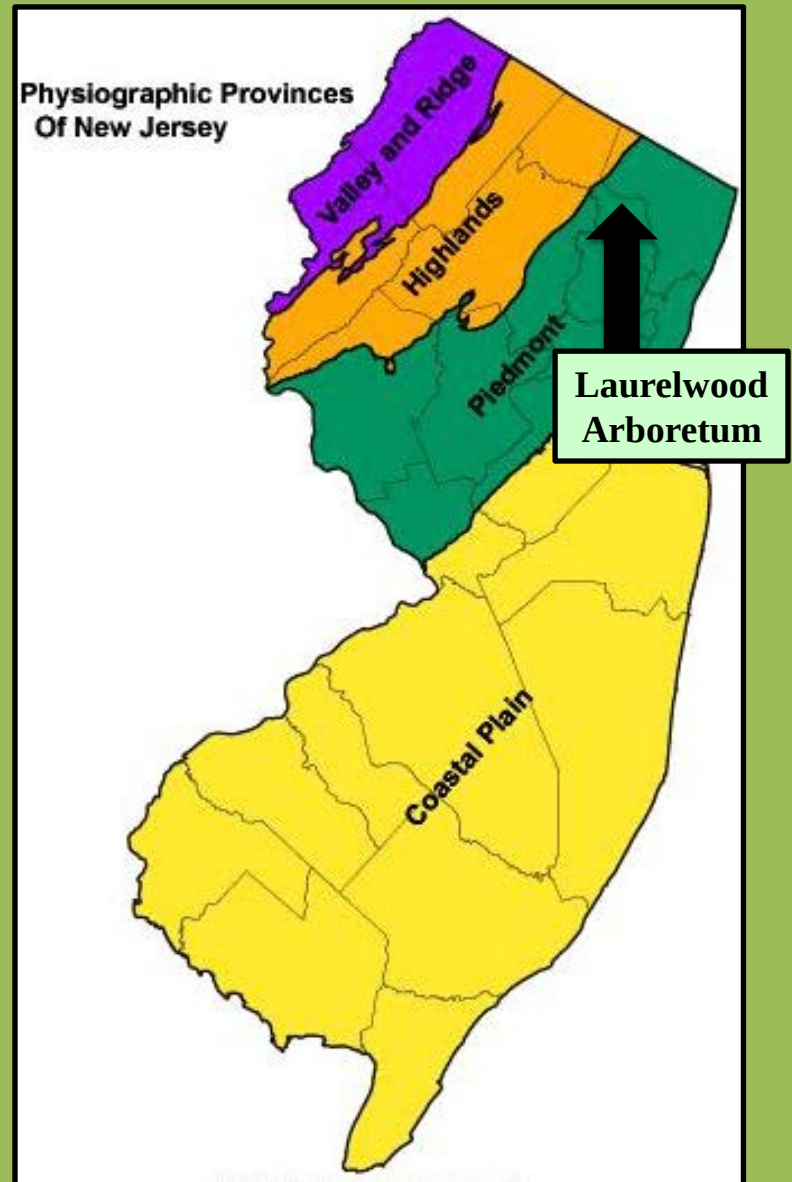
Broad Overview: New Jersey Geology

New Jersey is divided into 4
Physiographic Provinces based on:

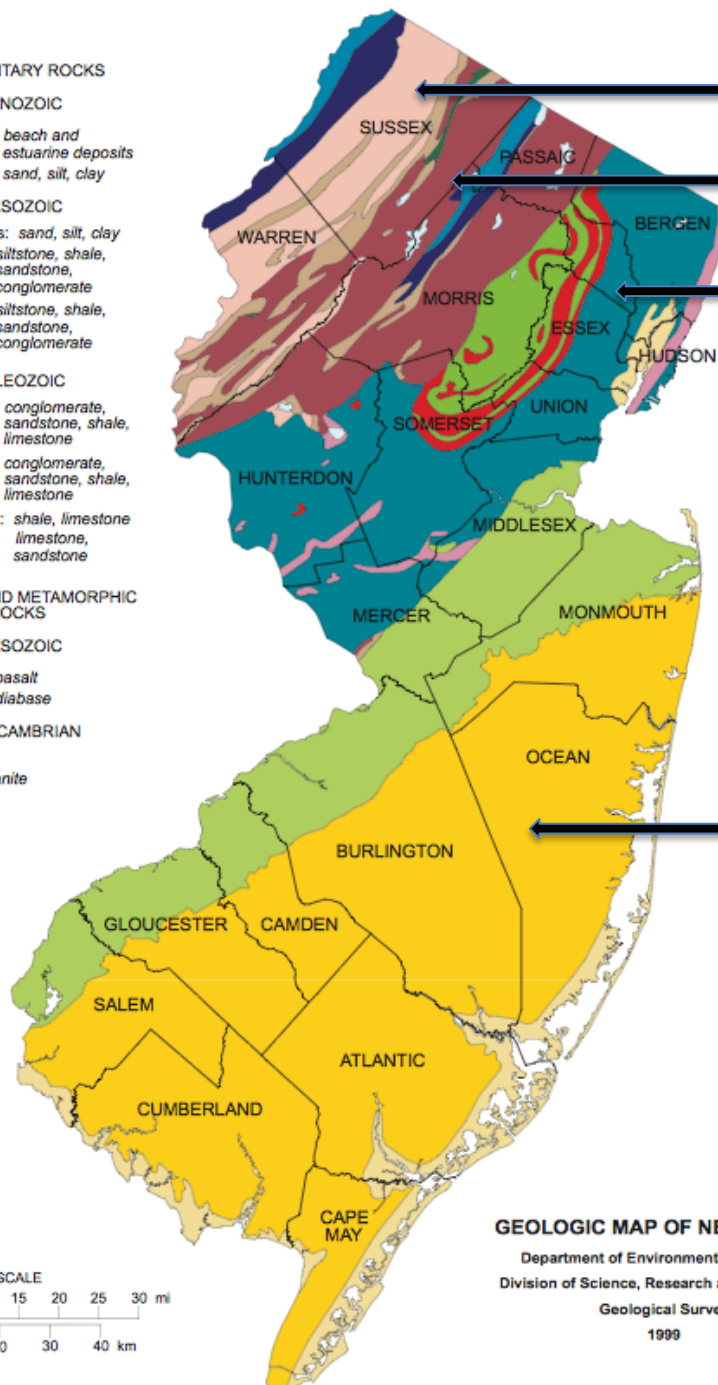
- 1) Rock Type
- 2) Location and Geologic Age
- 3) Topographic Signature
- 4) Process of Formation

The 4 Physiographic
Provinces include:

- 1) The Ridge and Valley
- 2) Highlands
- 3) Piedmont
- 4) Coastal Plain



- SEDIMENTARY ROCKS**
- CENOZOIC**
- Holocene: beach and estuarine deposits
 - Tertiary: sand, silt, clay
- MESOZOIC**
- Cretaceous: sand, silt, clay
 - Jurassic: siltstone, shale, sandstone, conglomerate
 - Triassic: siltstone, shale, sandstone, conglomerate
- PALEOZOIC**
- Devonian: conglomerate, sandstone, shale, limestone
 - Silurian: conglomerate, sandstone, shale, limestone
 - Ordovician: shale, limestone
 - Cambrian: limestone, sandstone
- IGNEOUS AND METAMORPHIC ROCKS**
- MESOZOIC**
- Jurassic: basalt
 - Jurassic: diabase
- PRECAMBRIAN**
- marble
 - gneiss, granite



Valley and Ridge

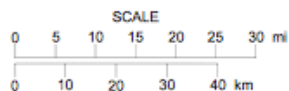
Highlands

Piedmont
Laurelwood Arboretum

Coastal Plain

***“The Old Man
of New Jersey”***

GEOLOGIC MAP OF NEW JERSEY
Department of Environmental Protection
Division of Science, Research and Technology
Geological Survey
1999



Rock Basics

Exactly like the Native (indigenous or local) and Exotic (imported) trees, Laurelwood Arboretum has local bedrock and transported rocks called glacial erratics.

Local Rocks

- Shale, Sandstone and Conglomerate (sedimentary).
- Made of particles of other rocks that have been chemically and physically eroded.
- Cemented together by the mineral hematite-iron oxide. Stains everything dark, reddish-brown.
- Topographic signature-more easily eroded than other rocks, forms the valleys throughout our area and the majority of the Laurelwood Arboretum bedrock.
- Age-Jurassic approximately 130 million years old.
- Fossils-Trace fossils and dinosaur footprints.
- Origin-Rifting of Pangaea and formation of modern Atlantic Ocean.



Towaco Formation sandstone-SE-corner of LA



Towaco Formation-Sandstone with Hematite Cement



Towaco Formation-E-side of LA

Local Rocks (cont.)

- **Basalt, Scoria, Gabbroid.**
- **Made from the cooling and crystallization of lava.**
- **Dark gray to black angular rocks consisting of the minerals pyroxene, plagioclase and olivine.**
- **Topographic signature-forms the mountains and hillsides throughout our area and the ridgelines to the east and west of the Laurelwood Arboretum. The nearby ridgelines are parts of the second and third Watchung Mountains.**
- **Age-also Jurassic approximately 130 million years old.**
- **Fossils-none**
- **Origin-also rifting of Pangaea and formation of modern Atlantic Ocean.**



Hook Mt. Basalt-NW-corner of LA



Hook Mt. Basalt-SE-corner of LA-Rock Garden



Hook Mt. Formation-Basalt-3rd Watchung Mt.
-Vizcaya Estates



Hook Mt. Formation-Basalt-3rd Watchung Mt.
-Vizcaya Estates Looking west

New Jersey Piedmont Rock Origin

The formation of the New Jersey Piedmont and Laurelwood Arboretum began in the Jurassic with Rifting and the Breakup of Pangaea.

Local sedimentary rocks were created by river erosion from topographically higher regions to the North and West. The Piedmont “Red Beds.”

Local igneous rocks were created by volcanic eruption and lava flows. The three *Watchung Mountains*.



Imported Rocks

- **Gneiss (Metamorphic) and others.**
- **Glacial erratics are large boulders that have been transported into the area by the activities of our last ice age. The majority of the large boulders consist of gneiss but many other rock types can be found-usually clastic sedimentary rocks.**
- **The gneiss comes from the Lower Hudson Valley of New York State near Harriman State Park. The clastic sedimentary rocks can come from as far away as Albany, New York and the Helderberg Mountain Region.**
- **Age: Mostly Precambrian**
- **Fossils: None in Igneous and Metamorphic Rocks, Rare in Sedimentary.**
- *****Combinations of Local and Imported Rocks have been used throughout the garden to stabilize drainage cuts and creeks that flow to Laurel Pond.**



Gneiss Erratic-
Harriman State
Park, New
State-between
Brook and
Ridge Roads,
LA



Green Pond
Conglomerate
Erratic-
Lower Hudson
Valley, NYS-
near Sensory
Garden, LA



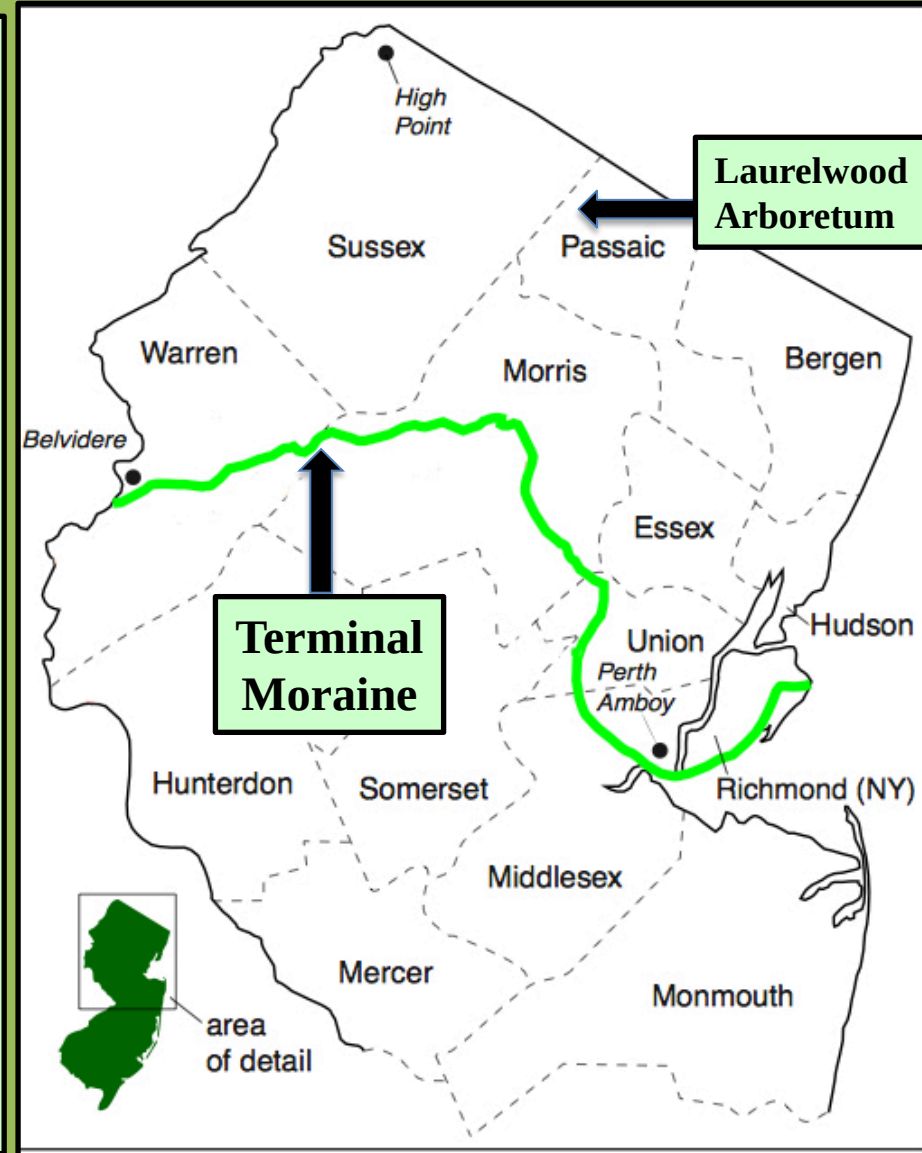
Fossiliferous
Sandy
Limestone
Erratic-
Clarksville, NY-
near Dorothy
Way, LA



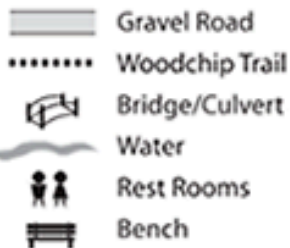
Brachiopod
Fossil Clam-
Marine
Origin

New Jersey during last Ice Age

- The northern one third of New Jersey was covered by a large continental glacier called the Wisconsin Glaciation.
- The maximum advancement is indicated by the terminal moraine-A ridgeline of transported rock. The green line on this map.
- Large boulders from the Lower Hudson Valley and Helderberg Mountain Region of New York State are scattered throughout this area of New Jersey and the Laurelwood Arboretum.
- The surface geology and drainage patterns throughout this region have been completely sculpted and modified by this glaciation.



LEGEND

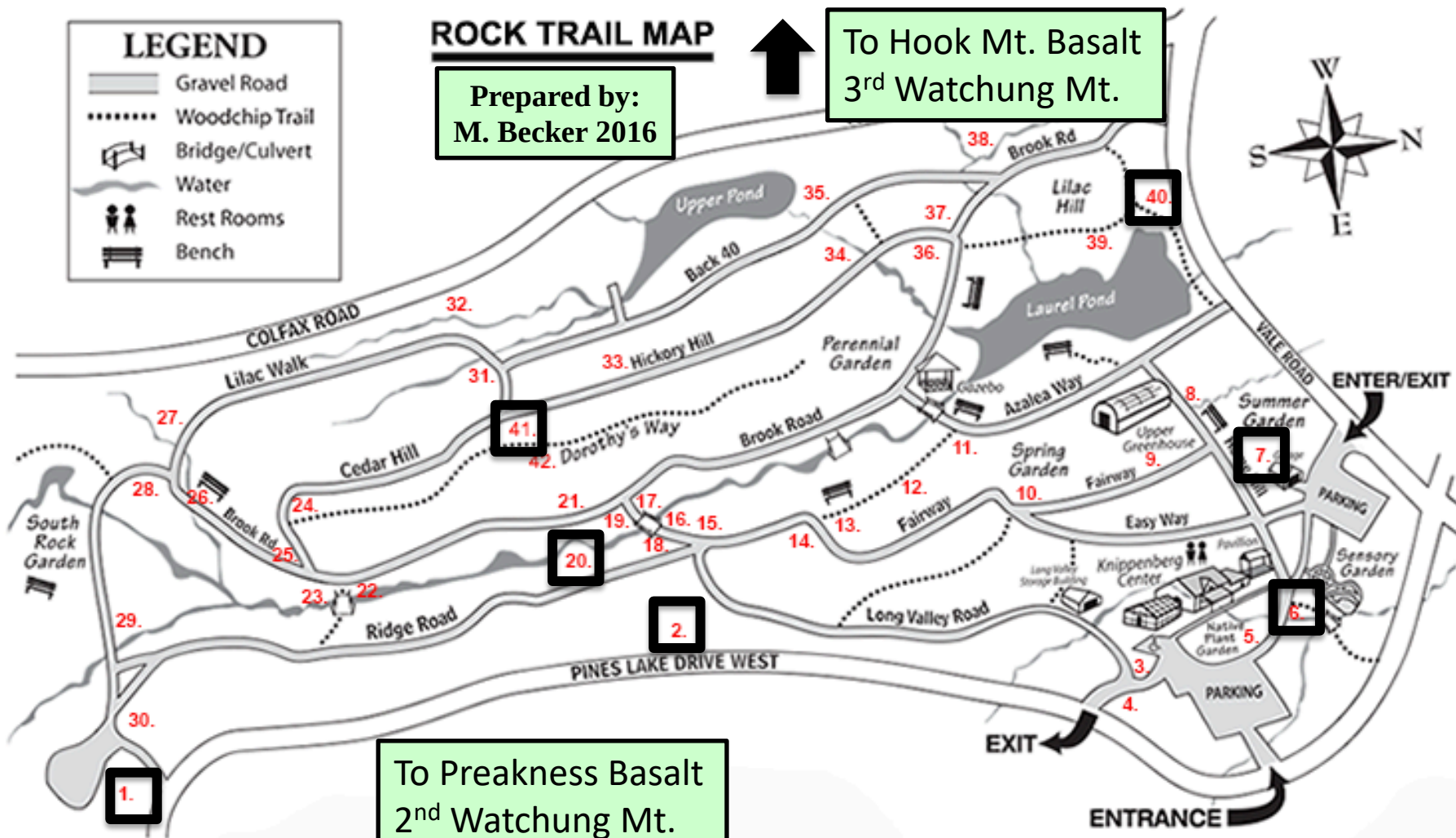


ROCK TRAIL MAP

Prepared by:
M. Becker 2016

To Hook Mt. Basalt
3rd Watchung Mt.

To Preakness Basalt
2nd Watchung Mt.



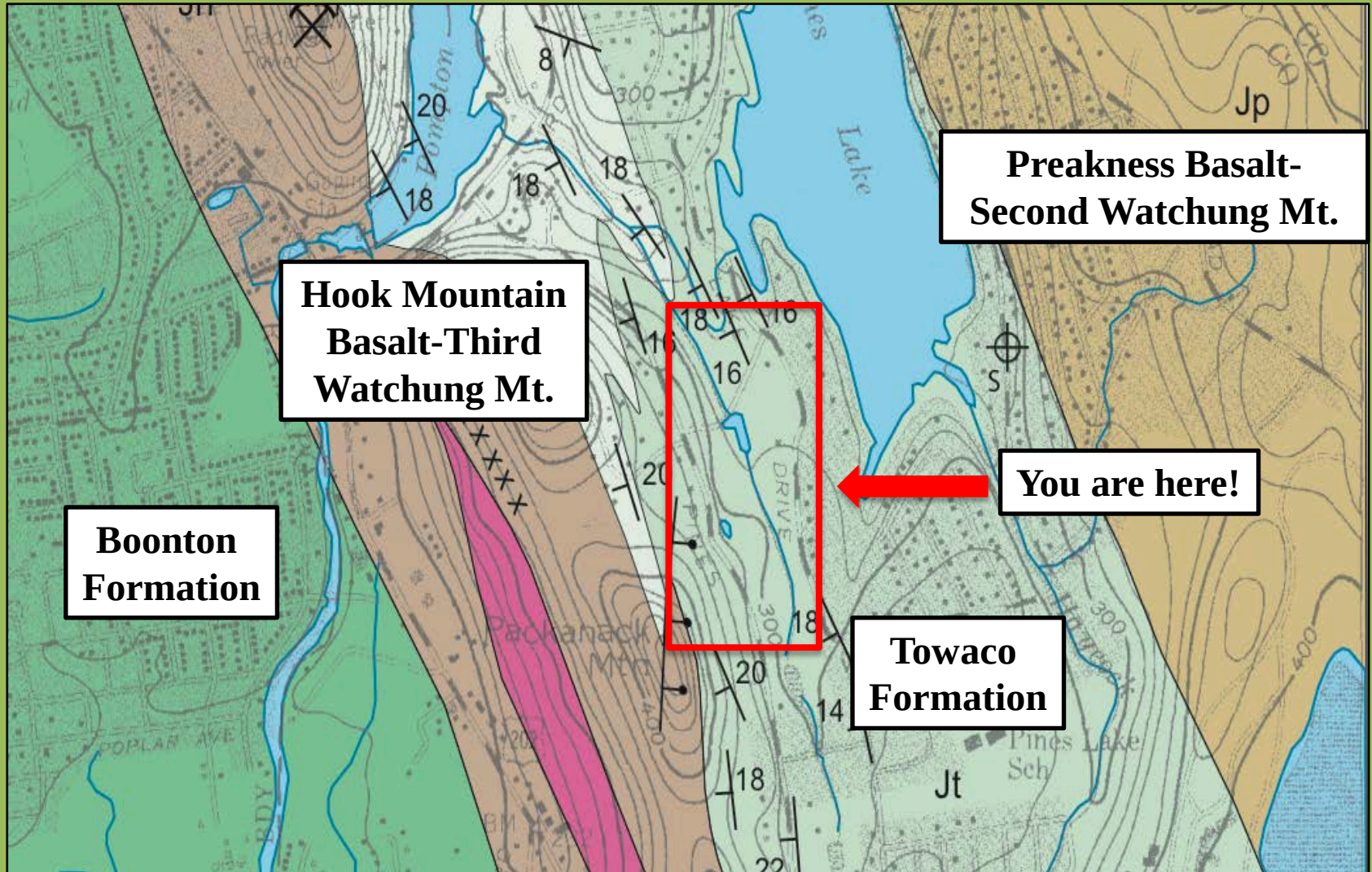
FOLA
Friends of Laurelwood Arboretum
Connecting People with Nature

Key to Rock Types

- 1,2,7. Towaco Formation-Conglomerate/Sandstone Outcrop (Local)
- 3. Granite (Import)
- 4,9-14,16-18,20-21,24,29-31,33,36-39. Gneiss (Import)
- 5, 28,32,42. Many glacial Erratics (Import)
- 6,15,35. Green Pond Conglomerate (Import)
- 8. Limestone (Import)
- 19,22,23,25-27,34,40. Basalt (Local)
- 41. Fossiliferous Limestone (Import)

SCALE
1/4 MILE

Bedrock Geology of Laurelwood Arboretum



Surficial Geology of Laurelwood Arboretum

Laurelwood Arboretum (Gravel/Stream Deposits)

-Qryt and Qry-Rahway Till

-r-bedrock exposure

Rahway Till-reddish yellow, sandy silt and sandy clay with weathered clasts of basalt and gneiss.

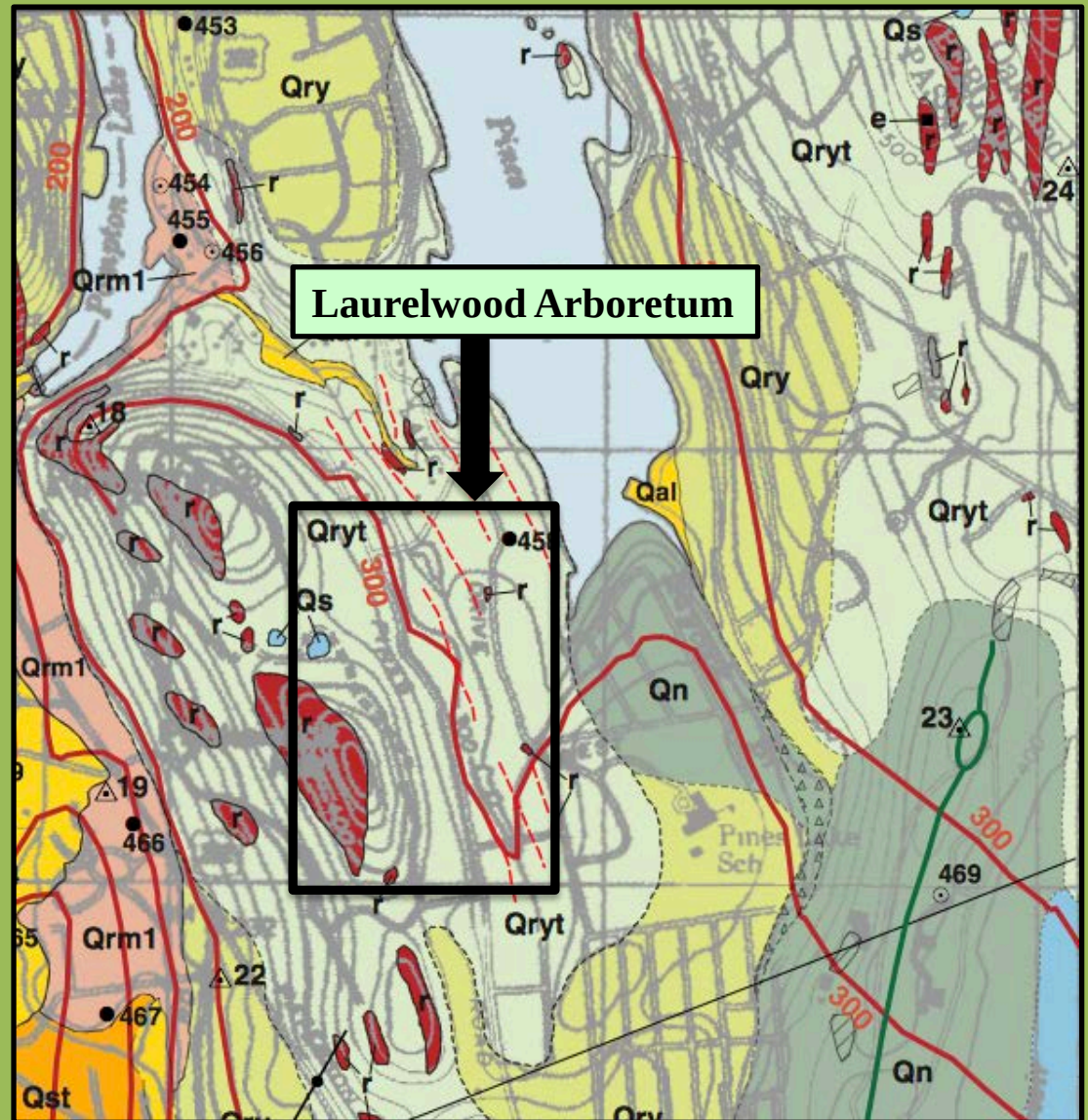
Surrounding Areas

-Qn-Netcong Till

-Qal-Alluvium

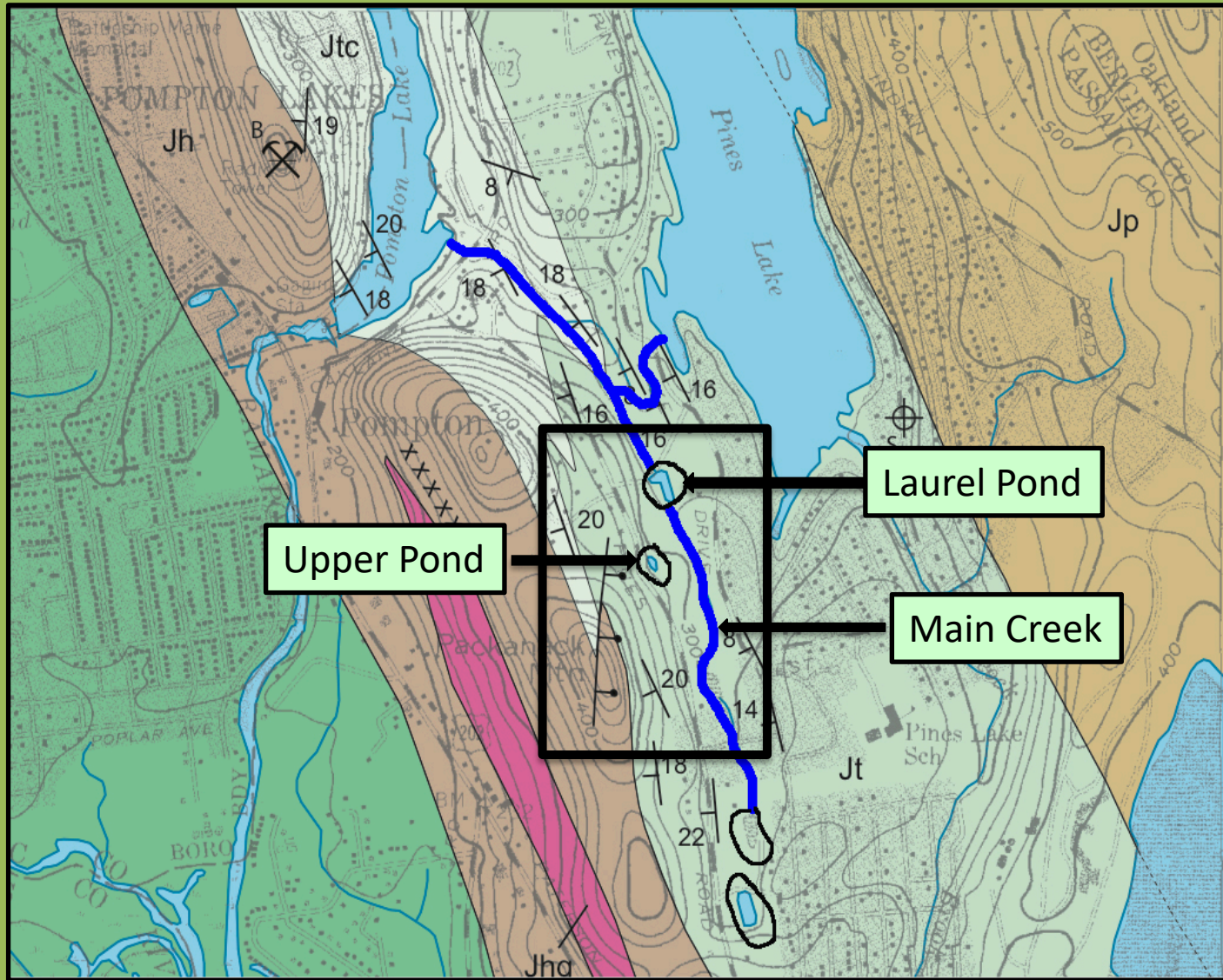
-Qs-swamp deposits

-Qst-Stream terrace deposits



Drainage and Surface Water in the Laurelwood Arboretum

- The drainage and surface water flow in the Laurelwood Arboretum is controlled by topography.
- Water from the second and third Watchung Mountains flows downhill into the valley of the Laurelwood Arboretum and eventually into the main creek.
- The main creek then flows northwest into *Laurel Pond*, the *Glenn* and into the *Pompton Lake*.



Some Geologic Recommendations for Laurelwood Arboretum: Good stuff that is happening!

- 1. Water is the most precious factor in the Laurelwood Arboretum.**
 - The main creek and the drainage network provides the lifeline to all the trees and plants.**
 - This main creek and its tributaries need to be kept open and flowing, free from leaf and tree litter, and animal waste.**
- 2. Soil profile needs to be protected from surface erosion by plant cover, mulch, and rocks walls along creek and drainage bends.**
- 3. Too much impermeable surface can result in rapid run off, accelerated erosion and inability to capture water for use in arboretum.**
- 4. Possible Future Consideration(s): Dredging Laurel Pond to capture more water to be used throughout the Arboretum . Recycling the dredged soil that will be rich in organics as a fertilizer/topsoil.**

Acknowledgements

Thanks goes out to:

-Bonnie Joachim and Jim Mac for inviting me to
speak about the Arboretum.

-All the members of the Laurelwood Arboretum for all their hard work
in making the Arboretum are really special place in our nearby backyards!

Some Sources for this Talk:

1. Roadside Geology of New Jersey; David p. Harper. 345p. Mountain Press Publishing.

New Jersey Geology Survey PDF Reports:

2. <http://www.state.nj.us/dep/njgs/pricelst/gmseries/gms10-1.pdf>

3. <http://www.state.nj.us/dep/njgs/enviroed/freedwn/psnjmap.pdf>

4. <http://www.state.nj.us/dep/njgs/enviroed/infocirc/glacial.pdf>

5. <http://www.state.nj.us/dep/njgs/pricelst/ofmap/ofm68.pdf>

Geology tour of some of the Laurelwood Arboretum to immediately follow.....