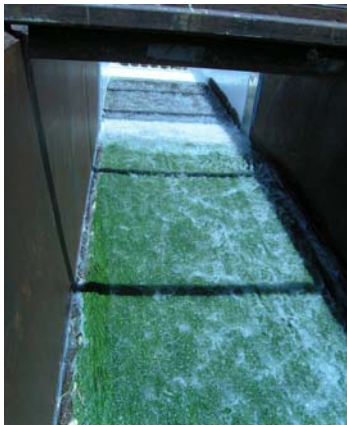


Geoweb® Cellular Confinement Systems are used for applications such as load support, earth retention, porous pavement, and slope and channel erosion protection. Hydraulic performance testing was conducted at Colorado State University Hydraulic Laboratory on an integrated system comprised of Geoweb® 30V6 and the North American Green C350 composite turf reinforcement mat. The C350 TRM was used because of known performance in the test apparatus. Six tests were conducted under the research to measure performance of the integrated system, identify stability threshold conditions and to quantify both hydraulic forces and soil loss.



The turf reinforcement mat was secured over the textured/perforated Geoweb section by ground staples at defined intervals in conformance with the manufacturer's recommendations. The integrated system was positioned in a planter test box at a 2H:1V slope angle. Vegetation was established over a 14 week period to allow root system integration within the perforated cells of the Geoweb material. Kentucky bluegrass was the chosen vegetation for this series of tests.

After saturating the soil prior to each of the six tests, the integrated system was subjected to flow discharges ranging from 15.0 cfs to 108.3 cfs. Two sets of water surface elevation data were taken; one at the beginning and one at the end of each hour-long flow to obtain an average depth. Vegetation density counts were also measured prior to and directly after each test at upstream, midstream and downstream locations.



**PRESTO GEOSYSTEMS**

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**Test Results:**

Exposed to the extreme flows, the system showed no measurable soil loss. It was observed that the vegetation had decreasing stem and blade-count during the total testing timeframe, however at a decreasing rate-of-loss.

Chosen grass type will influence the stem and blade loss. Typically a hardier grass type or blend would be used for field applications rather than pure Kentucky bluegrass.

At the completion of the test, an extracted soil sample showed vegetative root penetration to a depth of 1.5 inches, with larger roots interacting with the cell wall perforations. As future growth occurs, root interaction will increase.



No system instability was observed after the completion of the six tests. Outstanding system performance was determined for shear stresses up to 15.9 psf and for average velocities up to 26.5 ft/sec, with peak velocities over 29 ft/sec.

Due to facility constraints that prevented testing higher velocities than those reported, system failure limits were never found.

Test Number (No.)	Discharge (cfs)	Bed Slope (ft/ft)	Maximum Shear Stress (psf)	Average Velocity (ft/s)	Soil Loss (CSLI) (in.)	V*Rh (ft <sup>2</sup> /s)	Manning's n	Condition
1	15	0.5	11.5	10.1	0.008	3.7	0.053	Stable
2	25.8	0.5	11.7	15.4	0.056	6.5	0.038	Stable
3	40.1	0.5	14.1	18.6	0.056	10.0	0.036	Stable
4	60.2	0.5	15.1	22.3	0.056	15.2	0.032	Stable
5	89.9	0.5	15.2	25.4	0.056	22.6	0.029	Stable
6	108.3	0.5	15.9	26.5	0.056	27.0	0.029	Stable

The test results for the integrated system far exceed the limits of separately reported values of the Geoweb cellular confinement system and turf reinforcement mats with topsoil/vegetated infill.