



Natural Heritage & Endangered Species Program

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Calcareous Sloping Fen (S2)

State Status: None
Federal Status: None

Description: Calcareous Sloping Fens are diverse wetlands on shallow to moderate slopes, generally dominated by graminoid and herbaceous species typical of high pH wetland soils and open environments. These “calcicoles” are plants that do best on soils high in calcium, thereby restricting them to areas of calcium bearing bedrock and soil. Calcareous Sloping Fens are generally small, from less than one acre to two acres.

Environment: Slopes are shallow to moderate. Groundwater seeping from uplands is the main source of water to this type of wetland, and these waters are circumneutral to alkaline (pH 6.0-8.1) with high concentrations of calcium and magnesium cations and bicarbonate anions dissolved from bedrock or glacial materials rich in those elements. Other types of fens that may receive contribution from adjacent wetlands generally have lower concentrations of calcium and bicarbonate than do Calcareous Sloping Fens that form at the points of surface discharge of groundwaters that carry these materials. Areas of groundwater discharge may occur in stream headwaters or at the base of slopes.

The amount of flow changes across the season, with high flows in the spring and dryer conditions in the growing season. This is primarily a factor of higher evapotranspiration from upland sources occurring in the growing season, reducing flow downhill. Flow quantity, duration and timing may also change from year to year depending on annual and multi-year precipitation, though there will be a lag between precipitation and groundwater availability. Mineral soils are typical and may be exposed in areas of groundwater discharge. Where hummocks form, organic materials accumulate. Some form of disturbance is important to preventing dominance by woody species. Calcareous Sloping Fens have a shallower depth of organic matter than other types of calcareous fens due to more rapid and aerated groundwater flow.



Calcareous Sloping Fen with a rivulet carrying ground water into the fen. The yellow flowers are shrubby cinqfoil. Photo: Henry Woolsey, NHESP

Characteristic Species: Calcareous Sloping Fens are dominated by sedges, such as prickly sedge (*Carex interior*), delicate sedge (*Carex leptalea*), yellow sedge (*Carex flava*), tussock-edge (*Carex stricta*), marsh-sedge (*Carex lacustris*) and porcupine-sedge (*Carex hystericina*), and grasses including spiked muhly (*Muhlenbergia glomerata*) and fowl mannagrass (*Glyceria striata*). Herbaceous species include Kalm’s lobelia (*Lobelia kalmii*, WL), water-horehound (*Lycopus uniflorus*), grass-of-Parnassus (*Parnassia glauca*), rough-leaved goldenrod (*Solidago patula*), fen-goldenrod (*Solidago purshii*), and marsh fern (*Thelypteris palustris*). There is often a bryophyte layer, which may include Sphagnum (*S. magellanicum*, *S. warnstorffii*) and star campylium moss (*Campylium stellatum*), though moss cover is generally less in sloping fens than other fens. There may also be open shrub and canopy layers that may

contain sparsely distributed species including white pine (*Pinus strobus*), larch (*Larix laricina*), shrubby cinquefoil (*Dasiphora fruticosa* ssp. *floribunda*), autumn willow (*Salix serissima*, WL), and alders (*Alnus incana*, *A. serrulata*). Calcareous sloping fens generally grade into more forested communities upslope and more open wetlands downslope.

Invasive species tolerant of wet conditions noted in calcareous fens include reed canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), buckthorns (*Rhamnus cathartica* and *Frangula alnus*), Japanese barberry (*Berberis thunbergii*), and bush honeysuckle (*Lonicera morrowii*).

Calcareous fens are hotspots for rare species. At least eleven rare plants are associated with calcareous sloping fens including fen sedge (*Carex tetanica*, SC), slender cottongrass (*Eriophorum gracile*, T) and sweet coltsfoot (*Petasites frigidus* var. *palmatus*, E). Rare animals include turtles and dragonflies.

Range: Calcareous sloping fens are found in portions of New York, New Hampshire, Vermont, Massachusetts and Connecticut. In Massachusetts, which has some of the best examples (12 occurrences), calcareous sloping fens are found primarily in the western parts of the state where limestone and dolostone predominate.



Related Communities: Calcareous forest seeps form in similar geologic and topographic settings and may have similar shrub and herbaceous components, but also have a canopy generally of species of the surrounding forest. Calcareous seepage marshes are generally larger, on flat terrain and contain species adapted to deeper water such as cat-tails. However, they may contain many of the same species found in a calcareous sloping fen. The organic layer is generally deeper, and scattered shrubs may include swamp-birch (*Betula pumila*, E), meadow sweet (*Spiraea latifolia*), and poison sumac (*Toxicodendron vernix*). Calcareous basin fens are peatlands, dominated by sedges with a sparse shrub layer and likely contain a more developed bryophyte layer. Wet meadows may occur on shallow slopes at the edges of deeper waters, but have a different hydrology, as they are periodically saturated or inundated, and are often the result of mowing or grazing. Calcareous sloping fens may be found on the edges of deep or shallow emergent marshes, where groundwater discharge occurs. Riverside Seeps forming on calcareous bedrock can have similar species composition, and form along the banks of large rivers.

Status in Massachusetts: This community is ranked as S2, indicating there are 6-20 good occurrences. These are generally small and may occur in multiple patches. Vegetation succession leading to increasing shrub dominance can reduce the size of this community rare species habitat.

Management Considerations: Calcareous Sloping Fens are dependent on groundwater. Since they are small and isolated, slight changes can have significant impacts. Changes in the amount or quality of groundwater could profoundly affect species composition and abundance. Activities occurring uphill, such as groundwater withdrawal, could reduce flows to the fen. Surface discharges may also increase flows as well as erosion. Disturbance such as ditching or other alterations to drainage patterns can also have significant effects. Impounding of wetlands from road crossings or from beaver activity can increase water levels, flooding the fens and eliminating habitat.

At the same time, some form of disturbance is essential to maintaining the open, sparse shrub and minimal canopy of this community. Such disturbance may be in the form of periodic grazing or fire or periodic, but short-term flooding.

The shrub invasives may become established along the edges and any of these may alter rates of evapotranspiration or sedimentation.

For more information see:

Godwin, K.S., J.P. Shallenberger, D.J. Leopold, and B.L. Bedford. 2002. Linking landscape properties to local hydrogeologic gradients and plant species occurrence in minerotrophic fens of New York State, USA: a hydrogeologic setting (HGS) framework. *Wetlands* 22 (4): 722-737.

Mitsch, W.J. and J.G. Gosselink. 1993. *Wetlands*. Van Nostrand Reinhold, New York, NY.

Motzkin, G. 1994. Calcareous fens of western New England and adjacent New York. *Rhodora* 96 (885): 44-68.

NatureServe. 2009. Ecological association comprehensive report *Dasiphora fruticosa* ssp. *floribunda* / *Carex* (*sterilis*, *hystericina*, *flava*) Shrub Herbaceous Vegetation. Available via: <http://www.natureserve.org/explorer>. Accessed February 5, 2010.



Cross section of a calcareous fen at the base of a gravel terrace showing hollows where cold calcareous water flows between the hummocks where peat accumulates. There is a characteristic mix of graminoids and woody shrubs. Illustration: V. Salzman, NHESP.

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