

## **PIEDMONT/MOUNTAIN SEMIPERMANENT IMPOUNDMENT (PIEDMONT MARSH SUBTYPE)**

**Concept:** Type covers portions of Piedmont and Mountain floodplains affected by impoundment by beaver dams, along with the rare small man-made ponds that resemble them. This includes drained impoundments that are still distinguishable from pre-impoundment conditions.

Subtype covers portions of Piedmont examples with emergent or non-aquatic herbaceous vegetation predominating.

**Sites:** Floodplains of streams or rivers. On larger river floodplains, beavers dam sloughs or tributary creeks. Beavers generally prefer second order streams (Snodgrass 1997), but can use smaller or larger, and this subtype is also common on large river floodplains. Beavers strongly prefer low gradient streams, and many Piedmont and especially Mountain streams are probably too swift for them. Within beaver ponds, the Piedmont Marsh Subtype typically occurs as a zone on the edges, or fills the bed of drained ponds. Beavers sometimes build small dams within entrenched channels, where open water is confined to the channel itself, and in these cases, marsh created by the raised water table may occupy a broad part of the floodplain.

**Soils:** Can occur on any floodplain soil, though impoundment presumably modifies the preexisting soil if the pond lasts very long. Besides saturation, depletion of oxygen, and reduction, the still water of ponds traps sediment, and may allow deposition of relatively pure clay over sizeable areas. Kroes and Bason (2015) noted that ponds could be significant repositories for carbon storage, and that, though sediments in channels tend to wash out quickly if the dam was breached, sediment stored in floodplains might remain in place for centuries.

**Hydrology:** Permanently or seasonally flooded with shallow water, or unflooded but saturated on edges and in drained ponds.

**Vegetation:** Vegetation is dominated by herbaceous plants. Woody plants may be present with sparse to moderate cover, either as surviving trees, shrubs and small trees established on edges and on stumps, or young trees and shrubs beginning to invade drained ponds. The herbaceous vegetation tends to be extremely variable among sites and is usually very patchy and heterogeneous within sites. Descriptions often note several plant species which dominate patches, and though these sometimes may be large areas of near-monoculture, more often the patches are only a few square meters or the dominance is weak. Sizeable areas may have diverse herbaceous vegetation with no obvious dominant. The community as a whole may be quite rich in species in mature sites.

Plant species that frequently dominate patches include *Typha latifolia*, *Juncus effusus*, *Peltandra virginica*, *Scirpus cyperinus*, *Sparganium americanum*, *Impatiens capensis*, *Leersia oryzoides*, and increasingly, *Murdannia keisak*. *Sparganium americanum* often dominates in drowned channels that have deeper water than most of the marsh, but may dominate larger expanses. *Carex* spp. and *Persicaria* spp. also often reported as dominant at a generic level. *Carex crinita*, *Carex comosa*, *Carex stipata*, *Persicaria arifolia*, *Persicaria densiflora*, *Persicaria*

*hydropiperoides*, *Persicaria punctata*, and others have been reported as dominating patches, but less frequently. A wide variety of other species have rarely, often only once, been reported as dominating patches: *Decodon verticillatus*, *Echinodorus cordifolius*, *Erianthus giganteus*, *Glyceria septentrionalis*, *Gratiola viscidula*, *Pontederia cordata*, *Sagittaria latifolia*, *Scirpus polyphyllus*, and even *Zizaniopsis miliacea*. Additional herbaceous species with fairly high frequency include *Saururus cernuus*, *Carex lupulina*, *Boehmeria cylindrica*, *Dulichium arundinaceum*, *Ludwigia leptocarpa*, *Ludwigia palustris*, *Lycopus virginicus*, *Penthorum sedioides*, *Sagittaria latifolia*, and *Alisma cordata*. Additional species that are fairly frequent include *Bidens discoides*, *Bidens laevis*, *Glyceria striata*, *Hydrocotyle ranunculoides*, *Hypericum mutilum*, *Onoclea sensibilis*, *Lobelia cardinalis*, *Pilea pumila*, *Pluchea camphorata*, and *Woodwardia areolata*. The most typical woody species, on edges and on stumps, are *Alnus serrulata*, *Cephalanthus occidentalis*, *Salix nigra*, *Cornus amomum*, *Rosa palustris*, and *Hibiscus moscheutos*. *Fraxinus pennsylvanica* and *Acer rubrum* are the most likely tree species to have survived impoundment, and also are quick to begin establishing in drained ponds. *Betula nigra*, *Platanus occidentalis*, and *Liquidambar styraciflua* also may occur in drained ponds. Drained pond beds may also have a number of more ruderal species, including *Cyperus* spp. and *Microstegium vimineum*.

A diverse community of animals may use the ponds, including frogs and toads, lizards, turtles, snakes, and birds which are not common in the surrounding forest (Metts et al. 2001).

**Dynamics:** See the more extensive discussion of general beaver pond dynamics under the Open Water Subtype.

The Piedmont Marsh Subtype, as defined, has variable dynamics, with some being fairly stable zones and others being short-lived natural successional communities. Marsh vegetation may develop quickly when a pond is created or when a pond is drained and exposes formerly flooded area. It will continue to develop and change over time, as additional species colonize and as the environment evolves. Marsh vegetation may also develop gradually from the Open Water Subtype, as sediment fills an older pond. Conversely, the marsh may be slowly or quickly colonized by shrubs or tree saplings and develop into the Shrub Subtype. Very little is known about the duration of these successional stages within the life of a pond.

**Range and Abundance:** Ranked G4?. This subtype may occur throughout the Piedmont. No examples have been described in the foothills region, and it is unclear where the transition from Piedmont Marsh to Montane Marsh might occur. This subtype presumably occurs in South Carolina, and potentially in Virginia, Georgia, and more distant states.

**Associations and Patterns:** This subtype may be either a zone within a complex of other subtypes, or may be the only subtype present in drained ponds. In ponds where the dam is confined within the stream channel, a Piedmont Marsh Subtype community with a high water table but no standing water, may dominate much of the floodplain. This subtype likely borders some other floodplain community, or an upland, on one side.

**Distinguishing Features:** Semipermanent Impoundment communities are distinguished by vegetation and hydrology affected by impoundment by beavers. Small manmade impoundments

are included if they produce a similar environment and vegetation, but most reservoirs in the Piedmont and Mountains bear little resemblance to natural beaver ponds and should not be treated as natural communities.

The Piedmont Marsh Subtype is distinguished by dominance by emergent non-woody vegetation with vegetation and flora characteristic of the Piedmont region, sometimes with species more typical of the Coastal Plain. The Piedmont Marsh Subtype tends to be dominated by large graminoids, with zones of coarse forbs, and has less of the smaller forbs and boggy species of the Montane Marsh Subtype. Species with high constancy or dominant in Piedmont Marsh and scarce or absent in Montane Marsh include *Carex comosa*, *Carex stipata*, *Pericaria hydropiperoides*, *P. punctata*, other *Pericaria* species other than the tearthumbs, *Echinodorus cordifolius*, *Erianthus giganteus*, *Alisma subcordata*, *Saururus cernuus*, *Pontederia cordata*, *Scirpus polyphyllus*, *Hydrocotyle ranunculoides*, *Hypericum mutilum*, *Onoclea sensibilis*, *Woodwardia areolata*, and *Pluchea camphorata*.

Marshy beaver ponds in the upper Piedmont should be classified as the subtype their vegetation best resembles.

**Variation:** This subtype is extremely variable among sites and often extremely heterogeneous within sites. Although patches strongly dominated by a single species often occur, large areas are not strongly dominated. Rather than name variants by fine-scale patches/zones, it seems to make more sense to seek patterns in total flora or ecology. While more patterns may eventually be recognized, including perhaps examples that have flora with more or less Coastal Plain affinity, for now two variants are recognized:

1. Marsh Zone Variant – forming part of a complex in active ponds and expected to last as long as the pond, or to succeed only slowly to other communities;
2. Successional Marsh Variant – occupying the former bed of a drained pond, expected to quickly succeed to other communities, and typically having a more ruderal flora that can include less water-tolerant species.

Krues and Bason (2015) described a physical typology of beaver ponds that may be useful in describing their variation. The main pond forms, inundating (filling the floodplain), channel (flooding the channel only), and discontinuous (flooding part of floodplain and channel but with high ground on levees or rises) may be helpful, though additional types for sloughs and for backswamps in large floodplains would need to be added to the categories. The cluster configurations of pioneer (single pond), disjunct serial (several ponds nearby), and stair step serial (ponds running together) also appears useful.

**Comments:** As defined, this is an extremely variable and heterogeneous community. The NVC treatment of these communities is problematic. The association treated as the primary synonym here does not fit much of our vegetation well, yet is also defined broadly enough to potentially apply to rather different vegetation in other regions. Other associations are defined based on one or a few species that are patch dominants in this subtype, so that one could potentially apply them to one or a portion of our examples. These include *Juncus effusus* Seasonally Flooded Herbaceous Vegetation (CEGL004112); *Scirpus cyperinus* Seasonally Flooded Southern Herbaceous Vegetation (CEGL003866); *Typha (angustifolia, latifolia)* - (*Schoenoplectus* spp.)

Eastern Herbaceous Vegetation (CEGL006153). But if we were to attempt to name our vegetation patches as separate associations, many more associations would be required. In fact, most of our marshes have more mixed vegetation at the typical scale of measurement. However, they vary substantially from one part to another, as well as from one marsh to another, and the variation is not well characterized. It seems best to treat our Semipermanent Impoundments with a small set of subtypes based on structure and the regional floristic differences.

**Synonyms:** *Polygonum (hydropiperoides, punctatum)* - *Leersia* spp. Herbaceous Vegetation (CEGL004290).

Ecological Systems: Southern Piedmont Large Floodplain Forest (CES202.324). Southern Piedmont Small Floodplain and Riparian Forest (CES202.323).

**References:**

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