Aquatic and Wetland Plant Survey

Lake Oscaleta and Lake Rippowam,

Westchester Co., NY

2011

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Introduction and summary:

A survey was made in July and August, 2011, of the aquatic macrophytes of Lake Oscaleta and Lake Rippowam (including the Lake Oscaleta side of the channel between Lake Oscaleta and Lake Waccabuc) and wetland plants of their adjacent shorelines. The peak growing season for aquatic plants in the Northeast is during July and August, so 22 July, 27 July, and 23 August were chosen as survey dates. Janet Andersen participated in the survey on all three dates.

The 2011 survey had multiple goals:

1) To update the 2008 survey (conducted by rake-toss) of aquatic plants of Lake Oscaleta and Lake Rippowam, with special emphasis on shallow areas near shore, where lake-toss methods are difficult and impractical.
2) To survey, as time allowed, the vegetation of adjacent wetland areas.
3) To document all species located during the survey with pressed voucher specimens.
4) To assess the status of the population(s) of the state-listed wetland sedge, *Eleocharis quadrangulata* (Square-stem Spike-rush), previously documented from the Lake Oscaleta shoreline.
5) To compare the current population sizes of *Nymphaea odorata* (Fragrant Water-lily) in Lake Oscaleta and Lake Rippowam to 2008 population sizes, specifically addressing the question (and concern) posed by Three Lakes Council Executive Committee members regarding whether these populations are increasing in size.
6) To search extensively and intensively for any previously undocumented invasive species, especially the two species considered the highest threats, *Egeria densa* (Brazilian Elodea, previously located in Lake Waccabuc) and *Trapa natans* (Water Chestnut, under management in Mountain Lakes Camp ponds, adjacent to Lake Rippowam, for the past few years).

Brief summary of results:

- Forty eight species were collected and identified, including three species of aquatic plants previously unknown from Lake Rippowam, nine species of aquatic plants previously unknown from Lake Oscaleta, and a particularly interesting population of *Nymphaea odorata* with diminutive leaves discovered in Lake Oscaleta.
- One hundred twenty four voucher specimens (plus duplicates) were pressed, far more than originally anticipated.
- The population of the state-listed *Eleocharis quadrangulata* along the Lake Oscaleta shoreline was determined to be robust, with seven separate and distinct localities along the lake shore.
- Population sizes of *Nymphaea odorata* appear to be unchanged from 2008.

- No new invasive aquatic plant species were detected; one invasive shrubby species was identified in the wetland area adjacent to the channel between Lake Oscaleta and Lake Waccabuc.

Methods:

For ease of comparison of results, rake toss sampling methods followed those used by Allied Biological, Inc. (ABI) in 2008 (Lake Oscaleta, Lake Rippowam, and Lake Waccabuc) and 2010 (Lake Waccabuc). The Three Lakes Council supplied the boat (small fishing boat or motorized canoe), GPS, and weed anchors (garden rake heads attached to 10 m long rope). Sample points were chosen at approximately 100 m distances and their locations marked by GPS coordinates. Two rake tosses were done at each sampling point, and for each species retrieved, density was recorded as "trace," "sparse," "medium," or "dense." Realizing that not every species is easily "caught" by a garden rake head, and that some areas close to shore are difficult and impractical to sample by this method, an intensive visual survey was also conducted. Along many areas of the shoreline, this was done while wading, rather than from the boat.

Specimens were collected to document where in the lake each species occurs; these specimens were later pressed for herbarium voucher specimens, which will serve as a permanent record of the plants found in the lakes in 2011. Biological survey research is scientifically credible only when documented by voucher specimens. Voucher specimens from this survey will be sent (along with a label with the name of the plant, the collection date, and the locality) to herbaria at the New York State Museum (because it keeps track of the state's flora and fauna), the Brooklyn Botanic Garden (because of its active New York Metropolitan Flora Project in which Westchester Co. is included), and the University of Connecticut (because of active research on aquatic plants there), where they will be mounted on archival paper and filed with other specimens of the same species in insect-proof cabinets in a climate-controlled collections facilty. Properly prepared voucher specimens have many uses, including:

- providing the physical evidence to confirm the presence of plant species in specific locations at specific times (initial appearance and spread of invasives, decline of rare species, etc.);
- documenting the discovery of a new species, or a new locality for a known species;
- verifying the identity of a species reported from a particular locality (thereby correcting any misidentifications);
- documenting phenology (when the species flowers and fruits in that locality, length of growing season, etc.);
- providing material for morphological, anatomical, molecular, and floristic studies;
- contributing to a reference "library" that shows the range of variation present within the species (important for evolutionary studies).

Identifications were made to species in every case possible, based on Crow and Hellquist (2000a, b) and Gleason and Cronquist (1991). Aquatic/wetland plant experts Barre Hellquist, Don Les, and Robert Capers provided identification assistance. Identifications of all *Najas* collections were confirmed by DNA sequencing by researchers at the University of Connecticut; one specimen of each *Najas* collection has been donated to the herbarium of the University of Connecticut (CONN) as a contribution to NSF-funded evolutionary research on the genus *Najas* on a worldwide basis.

Results:

The list of species found in Lake Oscaleta and Lake Rippowam, and in adjacent wetland areas, is given in Table I. Except where noted with an asterisk, all species have been documented with pressed voucher specimens. In addition, two collections were made of *Chara* or other Charophycean algae, one in Lake Oscaleta and one in Lake Rippowam. Also, two shrubby species collected in the channel between Lake Oscaleta and Lake Waccabuc await definitive identification; one is included in Table I as "*Ilex* sp. (?)."

Pontederia cordata, *Potamogeton amplifolius*, and *Najas flexilis* had not been documented previously in Lake Rippowam. *Myriophyllum tenellum*, *Pontederia cordata*, *Potamogeton crispus*, *Najas flexilis*, *Elodea nuttallii*, *Hydrocotyle umbellata*, *Isoetes* sp., *Potamogeton berchtoldii* subsp. *gemmiparus* (= *P. pusillus* subsp. *gemmiparus*), and *Potamogeton bicupulatus* had not been documented previously in Lake Oscaleta. The reports of *Elodea canadensis* and *Potamogeton diversifolius* in Lake Oscaleta by ABI probably represent misidentifications, although—without voucher collections from the ABI survey—it is impossible to say for certain.

The population of *Eleocharis quadrangulata*, listed as "Endangered" in New York State along the Lake Oscaleta shoreline was determined to be robust, with seven separate and distinct localities along the lake shore. No additional state-listed species were found.

The populations of *Nymphaea odorata* (Fragrant Water-lily) appear to be unchanged from 2008 in both Lake Oscaleta and Lake Rippowam. *Nymphaea odoroata* was present at 47% of points sampled in Lake Rippowam in 2008, and 44% of points sampled in 2011. In Lake Oscaleta, *Nymphaea odorata* was present at 68% of points sampled in 2008 and 72% of points sampled in 2011. The <u>*total*</u> number of sampling points was increased by more than 50% in Lake Oscaleta in 2011 (101 vs. 60), and the slight increase in *Nymphaea odorata* frequency is due to the intensive sampling of this species (in other words, many of the additional sampling points were chosen specifically because *Nymphaea* occurred there) that was carried out because of the unusual morphology and extreme ranges of size and color noted in the Lake Oscaleta population (see "Discussion" section below).

Nymphaea odorata locations in 2008 (green dots) and 2011 (purple dots).

No new invasive aquatic plant species were detected. One shrubby invasive species, *Frangula alnus* (=*Rhamnus frangula*), Glossy buckthorn, was discovered in the channel between Lake Oscaleta and Lake Waccabuc. The following information (including photographs by Les Mehrhoff) is from the website of the Invasive Plant Atlas of New England (IPANE), http://nbii-nin.ciesin.columbia.edu/ipane/icat/browse.do?specieId=21:

> Description:
> *Frangula alnus* is a deciduous small tree or coarse shrub that grows up to 6 m (19.7 ft.) tall. It is often confused with *Rhamnus cathartica*. The young branchlets are pubescent. The short oblong to obovate leaves are 3-7 cm (1-2.5 in.) long and are arranged alternately. They are dark green (in the summer) and shining above, and glabrous or slightly pubescent beneath. The leaves turn greenish-yellow to yellow in the fall, and remain on the plant when most other species have already lost their leaves. The yellow-green flowers of *Frangula alnus* are bisexual and 5-merous, and arranged in 1-8 flowered sessile, glabrous umbels. This plant flowers after the leaves expand, from May to September . The fruit are globose drupes, changing from red to black, and are 0.6

cm (0.25 in.) across. They ripen from July to August. It is important to note that at any given time there can be flowers, partially ripened fruits (red) and fully ripened fruits (black) present on the same plant. The fruits of *Frangula alnus* are most often dispersed by birds.

Frangula alnus is native to Europe, North Africa and Central Asia. In the United States, this plant is present from Maine south to Pennsylvania and New Jersey, west to Michigan, Illinois, Indiana, North and South Dakota, Minnesota and Wisconsin. Like *Rhamnus cathartica*, this plant was introduced to the United States before 1800 and started to invade native habitats probably around the early 1900s. In Gray's Manual of Botany (8th edition), the plant is described as "recently and rapidly spreading; likely to become obnoxious."

Habitats in New England:
Abandoned Field, Early Successional Forest, Edge, Floodplain Forest, Forest Wetland, Pasture, Planted Forest, Roadside, Shrub Wetland, Vacant Lot, Wet Meadow, Yard or Garden. This plant tolerates more moisture and requires more light than *R. cathartica*, and can be found in swamps, fens and the edges of bogs. It also can be present in upland habitats such as woodland edges, fencerows and old fields.

Threats:
Frangula alnus is a great threat to wetlands, where it can form dense stands that cause the growth of other species to be suppressed. It is readily dispersed by birds, and the extended

productivity of the fruits allows it to be dispersed throughout the summer and fall. It is also an alternative host to crown rust fungi that infects oats.

Discussion:

Based on the diversity of aquatic plant species and the relatively few invasive aquatic plant species (primarily *Myriophyllum spicatum* and *Potamogeton crispus*), Lake Oscaleta and Lake Rippowam appear to be very healthy lakes. The paucity, or even complete absence, of aquatic plants in some parts of the lakes, particularly Rippowam, appears to be due to depth, rocky substratum, and steep banks (with very little suitable substratum in which plants can root), and a very narrow littoral zone.

The adjacent wetlands, particularly along the channel between Lake Oscaleta and Lake Waccabuc and on the SW side of Lake Oscaleta (area not surveyed), appear to be very species rich. About a third of the species documented in the current survey were present in the wetland along the channel between Lake Oscaleta and Lake Waccabuc.

Eleocharis quadrangulata (Angled Spike-rush) is listed as Endangered (S1) in New York State, based on at least one of the following: five or fewer extant sites; fewer than 1,000 individuals; restricted to fewer than 4 U.S.G.S. 7 1/2 minute topographical maps; listed as endangered by the U. S. Department of Interior. Its occurrence has been confirmed in only four counties in New York (Cayuga, Richmond, Suffolk, and Westchester) and is probable in three other counties (Oswego, Rockland, and Ulster) (Young, 2010). It is not rare or endangered globally, occurring widely throughout the eastern and midwestern U.S. Plants listed as rare or endangered in New York State, but not elsewhere, are often at the edge of their geographic range, and may therefore be subject to environmental conditions different from those closer to the center of their range. As a result, they sometimes have genetic differences that allow them to thrive in these conditions. Their populations are often important reserves of genetic diversity of the species as a whole and should be protected. They may also be important components of ecosystems uncommon in the state or indicate important processes taking place in otherwise common natural communities. When rare or endangered plants are protected, distinctive populations of species are preserved along with their genetic variation within their natural habitat (Young, 2010).

One of the most interesting species in Lake Oscaleta and Lake Rippowam is the native *Nymphaea odorata*, the Fragrant Water-Lily or White Water-Lily (also called Pond-Lily) (see photos below). This species is known for its variation in the size and color of both leaves and flowers, and this variation is remarkable in Lake Oscaleta (the variation appears to be less in Lake Rippowam, perhaps simply because the population there is smaller). The *Flora of North America* describes the underside of the floating leaves as being "usually deeply reddish or purplish, occasionally greenish," and the leaf stalk "uniformly greenish or more commonly reddish purple" (Wiersema and Hellquist, 1997). No mention is made of submerged leaves. In Lake Oscaleta, *Nymphaea* shows great variation in both leaf size and color (green leaf stalks and leaf undersides, reddish-purple

leaf stalks and leaf undersides, and reddish-purple leaf stalks with green leaf undersides). In addition, many small plants (seedlings?) have small, red, submerged leaves with a very different shape than the floating leaves (more arrow-shaped than round). Several avenues for further study could be considered, including a more thorough documentation of the variation that occurs in this species in Lake Oscaleta (e.g., Do size differences correlate with color differences? Are different sizes and/or colors found in specific areas of the lake? In what proportion does each color combination occur?) and investigation of the prevalence of the submerged leaves (e.g., Are they always small, red, arrow-shaped? Do they only occur on small rhizomes? Do they occur on all small rhizomes?). Experimentally germinating seeds to see what the seedling leaves look like would also be interesting.

Particularly interesting is a population of *Nymphaea odorata* found on the SW side of Lake Oscaleta, characterized primarily by diminutive leaves (about half the size of the minimum size given in both Wiersema and Hellquist (1997) and Crow and Hellquist (2000a)) with an uncharacteristic shape (more heart-shaped or arrow-shaped than round). Figures of some of these plants are included below (the ruler in the photos is in cm and inches). This form is not entirely unknown but is apparently extremely rare, and the conditions that produce it (whether genetic or environmental) have not been determined. After consulting with several aquatic plant experts, I am confident of their identification as *Nymphaea odorata*, but this form is very rare. They merit further study, and Barre Hellquist has expressed interest in seeing the population summer 2012. Ideally, molecular comparison of these plants with other *Nymphaea* plants in Lake Oscaleta could be carried out eventually.

Recommendations:

GPS coordinates for localities of *Eleocharis quadrangulata* should be reported to the New York Natural Heritage Program, with approximate numbers of individuals at each locality. Because this species is represented by a large total number of individuals in several small populations, no special care or precautions are recommended.

The Three Lakes Council should be particularly vigilant in searching for any sign of the invasive aquatic species *Trapa natans* (Water Chestnut). This species persists in ponds in Mountain Lakes Park, adjacent to Lake Rippowam, in spite of active management for the past few years. The nearest known populations of *T. natans* are thus extremely close to Lake Rippowam. The west end of Rippowam, closest to the Mountain Lakes Park ponds, has a dense cover of *Nymphaea*, where an initial colonization by *T. natans* could "hide out" undiscovered. The lily bed especially should be scrutinized often for any sign of *T. natans*. Because this species is an annual plant that relies on seed production for its propagation, hand removal before the plants set seed (ideally before they even flower) has proven to be a very effective means of control and even eradication. **If *T. natans* plants are ever found in Lake Rippowam (or Lake Oscaleta or Lake Waccabuc), they should be hand pulled immediately.**

Shoreline plantings by landowners can help prevent shore erosion and can improve lake water quality by filtering runoff. For landowners who desire to landscape with native plants, a number of species found in the channel between Lake Oscaleta and Lake Waccabuc may provide inspiration, including *Cephalanthus occidentalis* (Buttonbush), *Clethra alnifolia* (Sweet Pepper-bush, very fragrant), *Cornus amomum* (one of the native Dogwood species), *Osmunda regalis* (Royal Fern), *Rhododendron viscosum* (Swamp Azalea, beautiful flowers), *Rosa palustris* (Swamp Rose, beautiful, small-ish, pink flowers), *Vaccinium corymbosum* (Highbush Blueberry, edible), *Viburnum dentatum* (Arrow-wood), and *Viburnum nudum* var. *cassinoides* (Wild Raisin).

Further investigation of the extent of colonization by *Frangula alnus*, a shrubby species found in the channel between Lake Oscaleta and Lake Waccabuc is recommended. Various methods can be used to slow or stop its spread if it appears to have a strong foothold, such as cutting down adult plants and pulling seedlings and small saplings that are accessible.

Further surveys of areas of wetland habitat are recommended, for several reasons. First, time constraints made it impossible to thoroughly document emergent and wetland plants along the shorelines of both lakes. Also, there may be additional species in the wetland area adjacent to the channel between Lake Oscaleta and Lake Waccabuc that were missed during this (first ever) survey of that area. Finally, the extensive shrubby wetland area on the SW side of Lake Oscaleta appears to be very interesting and has not been surveyed at all. From a distance, it appears to be a habitat not typically found in the southern areas of the state but rather more typical of a habitat you might find in the Adirondack region, for example. There are almost certainly plant species growing there that do not occur in the areas adjacent to the channel between Lake Oscaleta and Lake Waccabuc or other areas of these lakes, and it is very possible that rare or endangered species not yet documented for these lakes occur there. There is even the possibility that species not previously documented for Westchester Co. would be found there, and it would certainly be good to know if any invasive species occur there. As with the lakes themselves, the diversity of native species in the adjacent wetland areas is one measure of ecosystem health, and lake and wetland ecosystems are intimately connected. Monitoring the health of the wetlands, including knowing what species occur in these wetland areas, and tracking changes over time, is as important for managing the lakes as knowing the species that occur in the lakes themselves.

Table I. Vascular plant species occurring in Lake Oscaleta, Lake Rippowam, and the channel between Lake Oscaleta and Lake Waccabuc. Yellow shading indicates invasive species.

Species	Oscaleta	Rippowam
Alisma subcordatum Water-plantain		X
Betula alleghaniensis Yellow birch	X	
Brasenia schreberi Water-shield	X	
Cephalanthus occidentalis Buttonbush	X	
Ceratophyllum demersum Coontail	X	
Cladium mariscoides Twig-rush	X	
Clethra alnifolia Coast white alder; Sweet pepper-bush	X	
Cornus amomum Knob-styled dogwood	X	
Cuscuta sp. Dodder	X	
Decodon verticillata Swamp Loosestrife	X	X*
Eleocharis acicularis Needle-rush	X	
Eleocharis quadrangulata Square-stem Spike-rush; Angled Spike-rush	X	
Eleocharis sp. Spike-rush	X	
Elodea nuttallii Waterweed	X	
Eriocaulon aquaticum Pipewort		X
Fagus grandifolia American beech	X	
Frangula alnus Glossy buckthorn	X	
Fraxinus pennsylvanica Red Ash	X	
Hydrocotyle umbellata Water Pennywort	X	
Ilex sp. (?)	X	

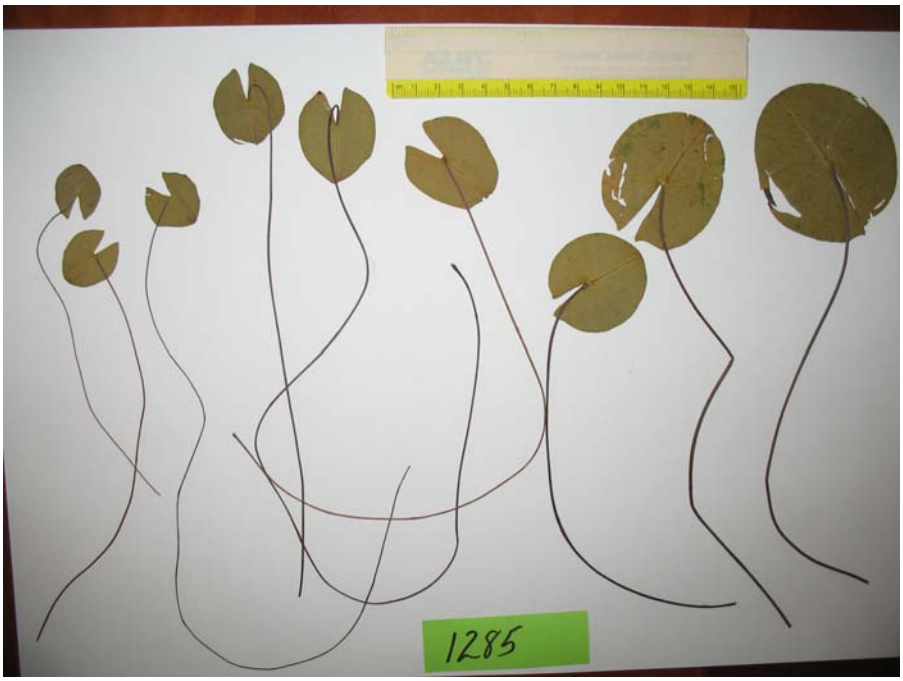
Isoetes sp. Quillwort	X	
Ludwigia palustris Water-purslane	X	X
Mimulus ringens Square-stem Monkey-flower	X	
Myriophyllum spicatum Eurasian Water-milfoil	X	X
Myriophyllum tenellum Slender Water-milfoil; Dwarf Water-milfoil	X	
Najas flexilis Slender Water Nymph	X	X
Najas minor Minor Naiad	X	
Nuphar sp. (juvenile) Yellow Waterlily	X	
Nuphar variegata Bullhead Lily	X	X
Nymphaea odorata Fragrant Water-lily	X	X*
Onoclea sensibilis Sensitive fern		X*
Osmunda regalis Royal Fern	X	X*
Peltandra virginica Arrow-arum	X	X*
Polygonum sp. Smartweed; Knotweed	X	
Pontederia cordata Pickerel-weed	X	X
Potamogeton amplifolius Large-leaved Pondweed; Bass Weed; Muskie Weed	X	X
Potamogeton berchtoldii subsp. *gemmiparus* (= *P. pusillus* subsp. *gemmiparus*) Pondweed	X	
Potamogeton bicupulatus Pondweed	X	
Potamogeton crispus Curly-leaved Ponweed	X	
Potamogeton epihydrus Leafy Pondweed	X	
Potamogeton foliosus Leafy Pondweed	X	

Potamogeton robbinsii Robbins' Pondweed	X	
Rhododendron viscosum Swamp-azalea	X	
Rosa palustris Swamp-rose	X	
Sagittaria sp. Arrowhead	X	
Schoenoplectus subterminalis (=*Scirpus subterminalis*) Water Bulrush	X	
Utricularia gibba Bladderwort	X	
Vaccinium corymbosum Highbush-blueberry	X	
Viburnum dentatum Arrow-wood	X	
Viburnum nudum var. *cassinoides* Withe-rod; Wild-raisin	X	

* No voucher specimen collected.

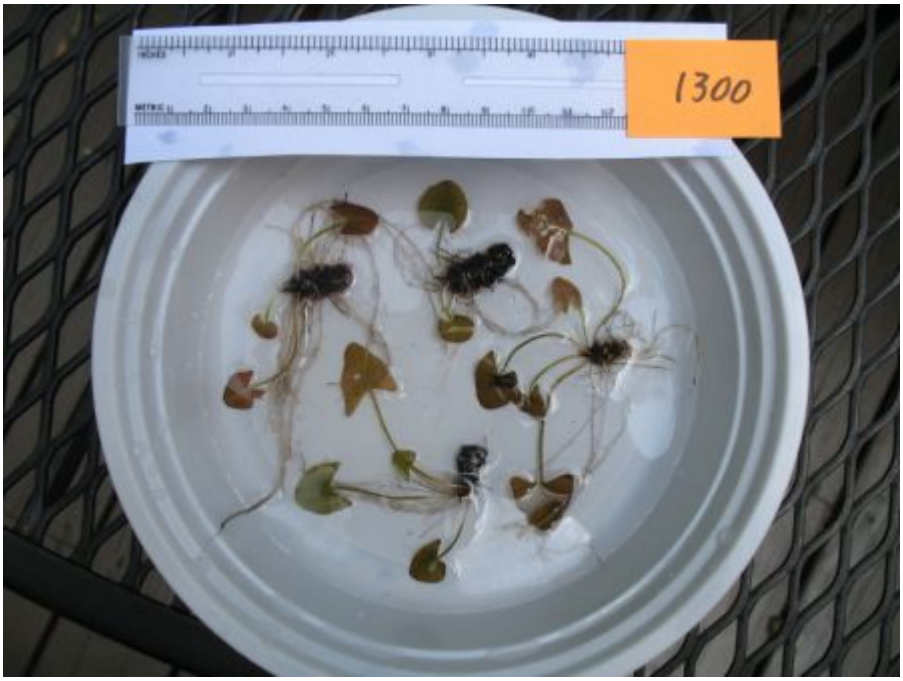
Smallest *Nymphaea* leaves collected; note green leaf stalks (ruler is in cm):

Size variation in *Nymphaea* leaves (ruler is in cm):



Size and color variation in *Nymphaea* leaves; leaves 1285 and 1291 have dark leaf stalks, difficult to see in photo (ruler is in cm).

Submerged *Nymphaea* leaves attached to small rhizomes (ruler is in cm and inches):



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