

**NOTEWORTHY RECORDS OF *COLOCASIA ESCULENTA* (ARACEAE)
IN ARKANSAS,
WITH NOTES ON ITS BIOLOGY AND ECOLOGY**

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ABSTRACT

Previous naturalized records of *Colocasiasculenta* in Arkansas were restricted to Clark and Garland counties. Additional occurrences from Arkansas, Hot Spring, Johnson, Miller, Ouachita, Pope, Pulaski, and Union counties are documented for the species. In Hot Spring, Ouachita, Pulaski, and Union counties, plants were well-established in extensive populations, with evidence of aggressive spread and colonization via stoloniferous offsets. The Arkansas, Johnson, Miller, and Pope county occurrences are represented by iNaturalist observations, which also appear to be escaped populations. A key to large-leaved Araceae in Arkansas, as well as notes on the ecology and invasiveness of *C. esculenta* in the state, also are provided.

Colocasiasculenta (L.) Schott (taro; elephant-ear) is native to warm-temperate and tropical Asia; however, this species has become a pantropical weed of warm-temperate to tropical regions, including the southeastern USA, where it is well naturalized (Wilson 1960; Godfrey & Wooten 1979; Serviss et al. 2000; Thompson 2000; Li & Boyce 2010; Wunderlin & Hansen 2011; García-de-Lomas et al. 2012; Kartesz 2015; Spaulding et al. 2019; Texas Invasives 2023; UF, IFAS, Center for Aquatic and Invasive Plants 2023; USDA, NRCS 2023; Weakley 2023). Despite its prevalence in many areas of the southeastern USA, it has not been well studied in Arkansas. In the state, naturalized populations for this species previously were known from Clark and Garland counties (Gentry et al. 2013; Serviss et al. 2017). Field work in 2023 by the authors documented it from multiple sites in Clark and Garland counties (Figs. 2–7) and three additional Arkansas counties — Hot Spring, Ouachita, and Union (Figs. 8–11, 13). Naturalized plants of *C. esculenta* also have been recorded from Pulaski County (Theo Witsell, pers. comm., 2023), along with iNaturalist observations from Arkansas, Johnson, Miller, and Pope counties (iNaturalist 2023). Based on our observations, *C. esculenta* likely is more widely established in the state than its current known distribution indicates (Fig. 1).

Naturalized plants from Arkansas all are the highly stoloniferous form of the species often referred to as *Colocasiasculenta* (L.) Schott var. *aquatilis* Hassk. (aquatic elephant-ear; wild taro; Figs. 3, 6, 9). At all sites, plants occurred in well-established populations, where stoloniferous offsets appeared to be the principal means of spread and colonization. The stolons are extremely brittle, which allows for fragmentation and subsequent transport of stolon fragments and/or offsets by water, facilitating spread and establishment (Serviss et al. 2017). Plants/ramets numbered in the 100s to 1,000s at all sites. Little to no evidence of sexual reproduction was observed. A few plants across multiple

sites had well-developed inflorescences (Fig. 2). No fruits or what appeared to be seedling plants were evident. At some sites, colonization and establishment even occurred in areas with dense shade.

Direct evidence for dispersal and subsequent establishment to remote areas was observed at Lake Catherine in Hot Spring County. *Colocasia esculenta* plants were distributed intermittently along ca. 2.75–3.3 kilometers of shoreline at the southeastern portion of the lake, as both large and small clusters of plants and isolated individuals (Fig. 8). Some of the isolated plants were separated by several meters from any other *C. esculenta* individuals, with one individual at least a few hundred meters from the closest other plants (Fig. 13A). Multiple stolon fragments, with and without well-developed offsets, along with larger offsets were observed along the waterline (Fig. 13B–F). Several of these offsets were rooted into the soil. Some of the larger, more established offsets, also presumably from long-distance dispersal, had newly produced stolons and associated offsets (Fig. 9). Numerous small groups of plants were observed that consisted of a few to many plants/ramets, which likely were generated in a similar fashion. Observational evidence suggests that water currents transported stolon fragments and offsets to new locations facilitating continued establishment, even in remote areas distant from groups of established plants.

A similar pattern of colonization, establishment, and long-distance dispersal via water was observed at White Oak Lake in Ouachita County, where it appeared that propagules were transported along a small canal interconnecting adjacent but otherwise separated areas of the lake. Plants also appeared to have spread into an essentially isolated pocket of water through overflow culverts, which connected it to the main lake (Fig. 10).

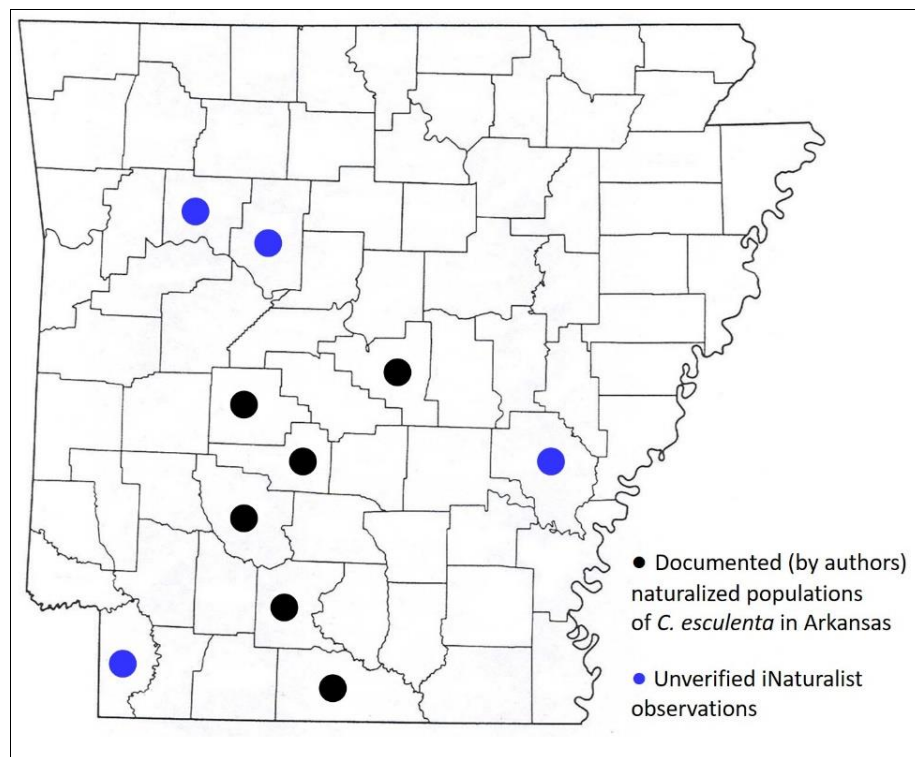


Figure 1. 2023 county distribution of naturalized *Colocasia esculenta* in Arkansas. Black circles indicate naturalized populations documented by the authors — Clark, Garland, Hot Spring, Ouachita, Pulaski (Theo Witsell, ANHC), and Union counties. Blue circles indicate iNaturalist observations, which also appear to be escaped populations — Arkansas, Johnson, Miller, and Pope counties (iNaturalist 2023). The true distribution of *C. esculenta* in the state likely is more widespread than these records indicate.

In Arkansas and the southeastern USA, naturalized plants of *Colocasia esculenta* are found in ditches, drainage canals, sloughs, swamps and marshy areas, along streams and riverbanks, backwater areas, pond and lake margins, in floodplain or bottomland forests, and spreading into adjacent areas from places of cultivation, including lawns and roadsides. The stoloniferous form will tolerate drier conditions and has been observed (in Arkansas) in more mesic soils on slopes above wet areas. It also can grow and establish (from initially cultivated plants) even in dry, well-drained, sandy soils and will regrow subsequent to hot, dry conditions where the above-ground portions of the plant were damaged by excessive water loss. Plants also will tolerate short-term exposure to freezing air temperatures as low as ca. -14.4°C (6°F) — observed in Arkansas in 2022, where plants perennated and regrew from the crown the following season post-exposure.

Most, if not all, Arkansas material of *Colocasia esculenta* probably is the highly stoloniferous form of the species. Wilson (1960) states that the highly stoloniferous form of *C. esculenta* that is naturalized in the southeastern USA is variety *aquatilis*. Matthews (1991) proposed that the widespread wild type var. *aquatilis* may be the basis for the selection and domestication of *C. esculenta* over a wide geographic range in Asia. Thompson (2000) indicated that weedy plants of *C. esculenta* in the USA essentially are all one morphologic form, usually with long stolons, and that this taxon has been called variety *aquatilis* in some treatments, citing Wilson (1960). As a species, *C. esculenta* is divided into numerous varieties and forms, based primarily on vegetative differences (Hill 1939; Wilson 1960; Bailey & Bailey 1976; Neal 1991; Griffiths 1992). A number of these horticultural forms are cultivated in Arkansas and could be encountered as either escaped or persistent from cultivation or horticultural discards (Serviss et al. 2000; Serviss et al. 2017) — *C. esculenta* var. *illustris* (Bull.) A.F. Hill was observed in Clark County in 2022 persisting from cultivation. *Colocasia esculenta* (L.) Schott var. *esculenta*, which produces large tubers but lacks the stolons of var. *aquatilis*, frequently is cultivated in Arkansas and also should be expected in the flora; it was observed in Clark County establishing from horticultural discards.

Voucher specimens. Arkansas. Clark Co.: 100s of plants/ramets naturalized in low wet woods along and in vicinity of small stream, plants occurred as individuals and small to large colonies, multiple (about 7) plants in flower, off Elaine Circle, S and E of the intersection of Elaine Circle and 21st St., Arkadelphia, 12 Oct 2023, *Serviss 8774* (HEND, ANHC); Numerous escaped plants along low moist area near Ouachita River, northeastern edge of Ouachita Baptist University (OBU) campus, plants also invading into higher ground on adjacent slope via stoloniferous offsets, a few plants in flower, Arkadelphia, 11 Oct 2023, *Serviss 8771* (HEND, ANHC); 100s of plants naturalized in and along stream of disturbed riparian zone and adjacent low woods, plants occurred both as individuals and small to large colonies, off Elaine Circle, S and E of the intersection of Elaine Circle and 21st St., Arkadelphia, 1 Sep 2017, *Serviss 8592* (HEND, ANHC); Several escaped plants along low moist area with disturbance near Ouachita River, northeastern edge of OBU campus, Arkadelphia, 20 Sep 2012, *Serviss 7619* (HEND, ANHC); many plants escaped in drainage ditch of arboretum area, spreading by stoloniferous offsets, off 10th St., Henderson State University campus, Arkadelphia, 10 Sep 2012, *Serviss 7588* (HEND, ANHC). Garland Co.: Several dozen plants/ramets naturalized and spreading via stoloniferous offsets along shoreline of inlet of Lake Hamilton, directly SW of intersection of Bayshore Dr. and Peninsula Dr., Hot Springs, 6 Oct 2023, *Serviss 8770* (HEND, ANHC); 100s or more plants/ramets naturalized and distributed intermittently along ca. 150 m of lakeshore and adjacent wet woods, a few plants with flowers, N side of bay arm of Lake Hamilton, directly S of Garvan Gardens, N of intersection of Arkridge Rd. and Gardens Edge Dr., 2 Oct 2023, *Serviss 8765* (HEND, ANHC); Three clumps of plants in dense colony, margin of beaver-impounded swamp, Ouachita Mountains, Central Hills, Ridges, and Valleys Ecoregion, USGS Fountain Lake 7.5' Quad, Hot Springs Village, SSE of Balboa Lake, 10 yds. SW of the Beaver Dam hiking trail, about 370 yds. SE of the trailhead off Cloaca Ln., 34.62001 -92.89977, 9 Oct 2017, *Keesling 17-0188* (ANHC); 20+ plants in colony on water's edge, boggy area, Ouachita Mountains, Central Hills, Ridges, and Valleys Ecoregion, USGS Jessieville 7.5' Quad, Hot Springs Village, W end of Desoto Lake, 20 yds E of Calella Rd, 0.1 miles SE of S Pego Way, and 0.2 miles N of Desoto Blvd., 34.67443 -93.03329, 5 Sep 2013, *Keesling 13-0116* (ANHC);

Three small patches of plants, apparently spontaneous, margin of beaver-impounded stream/wetland, Ouachita Mountains, Central Hills, Ridges, and Valleys Ecoregion, USGS Fountain Lake 7.5' Quad, Hot Springs Village, along Beaver Dam Trail and Cedar Creek, 400 ft. downstream from bridge to boat storage yard, 34.62068 -92.90093, 9 Sep 2011, *Witsell 11-0316* (ANHC); Andrew Hulsey State Fish Hatchery, S shore Lake Hamilton, plants escaped along shoreline, 20 Oct 2006, *Peck 06-733* (HEND, ANHC); Near entrance to Garvan Gardens but not planted, east end lake, bay arm. T3S R19W S33, Hot Springs, 19 Aug 2006, *Peck 06-166* (HEND, ANHC). Hot Spring Co.: 100s–1,000s of plants/ramets naturalized in multiple inlets and shoreline areas along ca. 2.5–3 km of shoreline, extensive spread and establishment via stoloniferous offsets, including dispersal to remote areas of the lake via water, a few plants with flowers, western side of Lake Catherine, Lake Catherine State Park, off ARK Hwy 171, 16 Oct 2023, *Taylor 101A* (HEND, ANHC). Ouachita Co.: Many naturalized colonies of plants/ramets along multiple areas of lake shore, evidence of long-distance dispersal of propagules by water and subsequent establishment, several (ca. 11–12) plants with flowers, N White Oak Lake, off ARK Hwy 387, 24 Oct 2023, *Serviss 8776* (HEND, ANHC). Union Co.: Two large groups of naturalized plants separated by ca. 21 m, along bank of intermittent stream, establishing via stoloniferous offsets, eastern-most edge of South Arkansas Arboretum, SE of intersection of N Timberlane Dr. and Mount Holly Rd., El Dorado, 15 Oct 2023, *Brotherton 86* (HEND, ANHC).

In Arkansas, there are a few morphologically similar species with which *Colocasia esculenta* can be confused, the most likely being *Peltandra virginica* (L.) Schott & Endl. (arrow arum; green arum; Fig. 12). Both *C. esculenta* and *P. virginica* have similar overall growth forms and occur in aquatic and wetland habitats. The peltate leaves and orange-yellow spathe of the spadix clearly distinguish *C. esculenta* from *P. virginica*, which has nonpeltate leaves and a green spathe. **The large-leaved species of Araceae in Arkansas** (excluding the traditionally Lemnaceous genera *Landoltia*, *Lemna*, *Spirodela*, *Wolffia*, and *Wolffiella*) can be distinguished using the following key.

1. Plant essentially acaulescent, consisting of a rosette of leaves, densely pubescent, stoloniferous; usually floating aquatic or sometimes rooted into open soil along edge of water ***Pistia stratiotes***
1. Plant caulescent or at least with clearly petiolate leaves, glabrous, stoloniferous or not; typically rooted into substrate, even in standing water.
 2. Leaves compound with 3 or more leaflets.
 3. Leaves palmately compound with 3–5 leaflets.
 4. Abaxial surface of mature leaves lustrous, not glaucous ***Arisaema quinatum***
 4. Abaxial surface of mature leaves glaucous ***Arisaema triphyllum***
 3. Leaves pinnately compound with (5–)7–15 leaflets, sometimes a few of them reduced to lobes rather than distinct as leaflets ***Arisaema dracontium***
 2. Leaves simple, often lobed.
 5. Leaves with a conspicuous pattern of whitish-green coloration on the adaxial surface, variable as to extent, sometimes restricted to the lamina around the major veins, sometimes more abundant ***Arum italicum***
 5. Leaves more or less uniformly green on the adaxial surface, sometimes with pale green venation in *Peltandra*.
 6. Lamina with prominent raised venation; plant a rare waif ***Alocasia macrorrhizos***
 6. Lamina without raised venation; plants widespread in occurrence.
 7. Leaves not peltate and with three conspicuous palmate primary veins; spathe green; plants without elongate stolons ***Peltandra virginica***
 7. Leaves peltate and pinnately veined; spathe orange-yellow; plants typically with prominent, elongate stolons, to 2.5 m or more in length ***Colocasia esculenta***



Figure 2. Large *Colocasia esculenta* plant in flower at Lake Hamilton in Garland Co., Arkansas (2 Oct 2023). Relatively few plants/ramets were observed with flowers across all sites visited, with less than 1% having reproductive structures. In Arkansas, flowering typically occurs in late summer or autumn and fruit production appears to be rare, if it occurs at all. The fruit is an orange, few-seeded berry; however, Thompson (2000) indicated that seed production in the USA flora has not been observed.

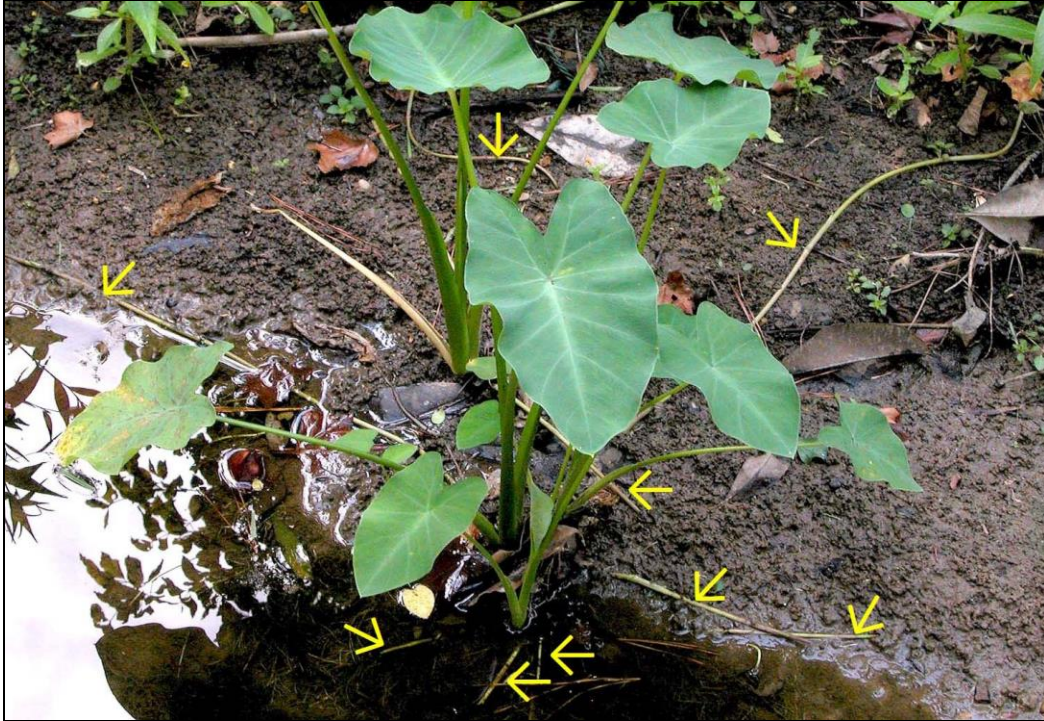


Figure 3. *Colocasia esculenta* from Clark County with elongate stolons — similar plants were observed at all Arkansas sites investigated. Stolons are indicated with yellow arrows. Nine individual stolons can be seen; these produced from only three plants.



Figure 4. *Colocasia esculenta* well-naturalized in Clark Co., Arkansas (12 Oct 2023). Shown is a small portion of a large colony of hundreds or more plants/ramets established in a semi-wooded overflow area of a small stream in a highly disturbed riparian zone in the city of Arkadelphia. Numerous colonies and individual plants are present at this site.



Figure 5. *Colocasia esculenta* escaped in Clark Co., Arkansas (11 Oct 2023). Numerous plants/ramets were present at the end of a backwater area of the Ouachita River — plants also were spreading asexually via stoloniferous offsets into more mesic soils along the base of an adjacent slope (top of photograph).

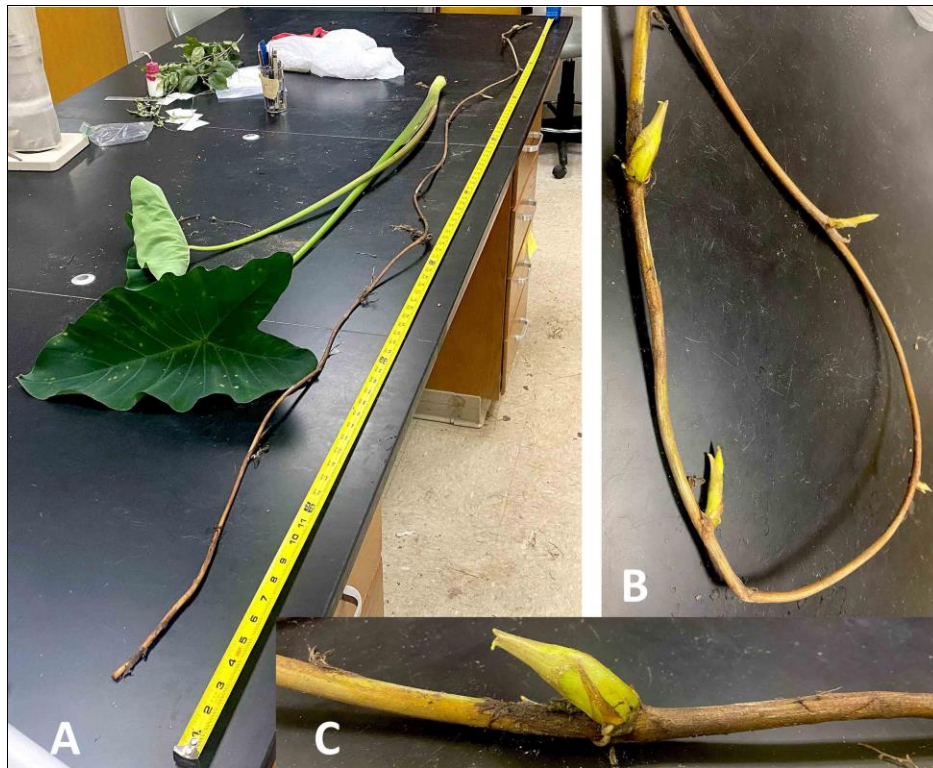


Figure 6. A–C. Stolon and associated offsets from naturalized *Colocasia esculenta* in Clark Co. A. Single stolon that measures 2.64 m in length. B. Four developing offsets at the nodes; the terminal offset had broken off. C. Close-up of one of the offsets showing emergent adventitious roots. Plants are capable of rapid spread because each plant can produce multiple stolons and each stolon multiple offsets.



Figure 7. *Colocasia esculenta* escaped in Garland Co., Arkansas (2 Oct 2023). Shown is a small portion of a large, expansive colony numbering hundreds of individual plants/ramets along the southwestern shore of Lake Hamilton. Numerous similar colonies of plants/ramets occurred intermittently along ca. 150 m of shoreline. Plants were growing in water and spreading into the soil above the water line. Nearly all spread and establishment appeared to be via stoloniferous offsets.



Figure 8. *Colocasia esculenta* well-naturalized in Hot Spring Co., Arkansas (16 Oct 2023). Many hundreds (or more) of plants/ramets intermittently occupied a length of shoreline well over 2 km. Both large and small groups of plants and isolated individuals were present. Most plants occurred in shallow water or wet soil at the end of small coves and inlets; a few groups of plants occurred along more exposed areas of shoreline.



Figure 9. Nascent colony from dispersal of single stolon fragment or offset on the shore of Lake Catherine (16 Oct 2023). Isolated, young but established plant producing stoloniferous offsets. Two of the multiple offsets present can be seen in the photograph — bottom-middle and center-left. Several stolons, all originating from the same plant, also can be seen. One of the longer stolons (present in the upper-right) has the apex and associated offset(s) beyond the field of view.



Figure 10. A–B. *Colocasia esculenta* naturalized in Ouachita Co., Arkansas (24 Oct 2023). A. Colonization and establishment from long-distance dispersal of propagules by water, with transport of propagules to an isolated inlet via overflow culverts that connected it to the rest of the lake (shown). B. Well-developed but still attached stoloniferous offset producing new stolons — an effective means of rapid colonization.



Figure 11. *Colocasia esculenta* escaped in Union Co., Arkansas (15 Oct 2023). Two groups of naturalized plants occurred at one end of a small, intermittent stream. The origin of the plants is unknown; however, spread and establishment via stoloniferous offsets are apparent. The group of plants in the photograph occurred downstream a distance of ca. 60–70 m from the other group. Transport of stolon segments and or offsets from the upstream plants likely was the initial source of establishment for these plants.



Figure 12. *Peltandra virginica* and *Colocasia esculenta* for comparison. Both species are shown growing together in wet, boggy soil along the shore of White Oak Lake in Ouachita County — *P. virginica* on the left; *C. esculenta* on the right.



Figure 13. A–F. Long distance dispersal and establishment of *Colocasia esculenta* via stolon fragments and offsets at Lake Catherine in Hot Spring Co. (16 Oct 2023). A. Young, establishing ramet in a remote cove along the shoreline — the nearest *C. esculenta* plants were several hundred meters distant. B. Recently deposited propagule consisting of a stolon fragment and associated ramet that had begun to root into soil. C. More established ramet isolated along the shoreline where heavy deposition of debris and other propagules via water had occurred (the waterline can be seen at the top of the photograph). D. Offset from buried stolon at shoreline — notice the offset itself is producing another stolon. E. Establishing offset from stolon fragment that presumably was deposited at the shoreline via water. F. Stolon fragment with developing offsets and adventitious roots that was present along the shoreline.

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