

Report of Barnes Nursery East Sandusky Bay Hydrology Restoration Project

**Prepared by: TRC Environmental
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November 8, 2001

**Regarding: US Army Corps of Engineers
Permit Application # 2000-02170(1)**



Project 33844

November 9, 2001

Ms. Sharon Barnes
Barnes Nursery
3511 West Cleveland Road
Huron, OH 44839

RE: East Sandusky Bay irrigation channel permitting issue

Dear Ms. Barnes:

Per our discussion, the following responses are provided to the questions presented to TRC Environmental (TRC) by Barnes Nursery related to permitting issues associated with improvements to an irrigation canal extending into East Sandusky Bay. TRC's responses are based upon a site reconnaissance undertaken on September 7, 2001 by Dr. Gary R. Finni, TRC, and Dr. Virgil Brack, Environmental Solutions & Innovations, LLC (ESI) and a review of materials provided by Barnes Nursery, information available from the public domain, and a professional interpretation of the facts. Dr. Finni and Mr. James Bissell, Cleveland Museum of Natural History, revisited the site on October 3, 2001 to further evaluate management alternatives.

Background

On June 20, 2000 a Nationwide Permit No. 27 (NWP 27) was issued Barnes Nursery by the U.S. Army Corps of Engineers (USACE) to construct a 3,000-foot-long channel flanked by earthen nesting islands. By July 21, 2000, approximately one half of the project had been completed. On that date Barnes Nursery was requested to stop work while USACE reevaluated the project. In January 2001, the Buffalo District Commander USACE determined that the primary purpose of the project was to provide a constant water supply to support nursery operations rather than habitat enhancement, thereby deeming NWP 27 inapplicable for this type of project and that the permit affirmation was issued in error. At that time, Barnes Nursery was given the options of restoring the site to its pre-construction condition or applying for an after-the-fact authorization to be evaluated as an individual permit (IP). Subsequently, Barnes Nursery filed for an IP and responded to several rounds of questions from commenting agencies regarding the IP application.

National Wetland Inventory Maps (NWI) maps developed from 1977 aerial photography indicate that approximately 1/3 to 1/2 of the bay (formed by a triangle widest to the east – including Sheldon Marsh — and narrowing to a point to the southwest) was an emergent wetland (L2EMZ = Lacustrine, Littoral, Emergent, intermittently exposed/permanent). Today much of that area in Sheldon Marsh is scrub-shrub (successional woods) and mud flat out in the bay area. In 1977, much of the rest of the bay (including the nature preserve) was open water (L2OWZ, = Lacustrine, Littoral, Open Water, intermittently exposed/permanent), whereas today, a portion of this area is an emergent wetland formed by the breaching of and subsequent alluvial deposits from the barrier island forming the northern edge of the bay. The canal lies along the former (1977) interface of these two wetland types.

TRC provides an overview of biological conditions in the project area and a perspective on management issues regarding the channel and associated islands. Questions 1 through 10 (bold) were provided by Barnes Nursery and are followed by TRC's responses.

1. Will the island(s) provide the quiescent water for emergent wetland plants to spread across the barren mud flat and shallow water environment south of the reservoir channel?

A field reconnaissance of Barnes Nursery property adjacent to East Sandusky Bay was conducted on September 7, 2001 to document conditions occurring along the reservoir channel that provides irrigation water for the nursery. On September 7, the majority of East Sandusky Bay was a mud flat while the channel providing irrigation water to Barnes Nursery (project area) was flooded (open water). Areas shoreward (south) of the channel and spoil placed north of the channel were vegetated (Photograph 1, and Addendum Exhibit A), indicating that the spoil pile provided a suitable medium for plant growth. The spoil pile also provided sufficient protection to the southern shoreline to enable wetland vegetation to colonize and grow to the canal's edge, whereas the open bay to the north was unsuitable for plants.

An analogous situation, protection from erosion and emergent plant growth, was noted in the area immediately south of the barrier island in East Sandusky Bay. This area receives alluvial deposits from the island when it was over-topped during storm events. This area, immediately south of the barrier island, is sufficiently protected from waves generated in the Bay to enable emergent vegetation to grow south of the barrier island. (See Addendum, Exhibit B)

Currently, many species have colonized the spoil and shoreline in the project area such that portions of the shoreline area now meet the U.S. Army Corps of Engineers definition of a wetland, i.e., the southern shoreline in the project area has appropriate soil, hydrology, and wetland plants. Additional management can significantly shape the wetland ultimately produced by nature. Management activities should be designed to help provide a competitive advantage to desirable natural species to enhance natural wetland development. Without management, invasive exotic species may predominate.

Factors that define wetlands, and that can be managed and manipulated to define the resulting wetlands are soils, hydrology, and plants.

- **Soils:** much of the bay is Millsdale, a silty clay loam and it is classified as a hydric soil. These soils are defined as being in a depression, poorly to very poorly drained with a water table ≤ 1.0 foot from the surface during the growing season . . . and soils are frequently ponded for long or very long duration during the growing season.

A band of Lenawee, also a silty clay loam follows the shoreline. According to a list of hydric soils provided by Erie County Natural Resource Conservation Service, and according to the NRCS, USDA listing and definition of hydric soils for Erie County, Ohio, Lenawee is not hydric. However, according to the NRCS, USDA listing and definition of hydric soils for the state of Ohio, Lenawee is hydric. While it is not considered a depressional landform, it is given hydric criteria ratings like those for the Millsdale.

In general, the project area has soils suitable for wetlands development.

- **Hydrologic regime:** the amount and timing of water will favor some species and hinder others. The bay has a daily water level fluctuation of 0.6 feet , and under average conditions, the water depth at the project site prior to construction was at least 0.6 feet. We are also informed that fluctuations of water level in . . . [the] bay are primarily wind induced surges . . . and that only minor contributions of water to the East Sandusky Bay come from surface run off . . . By managing the hydrology in the shoreline portion of the project area, Barnes Nursery can exert some control over future wetland development. We suspect that the addition of more water may be helpful in establishing and maintaining a desirable, natural emergent wetland shoreward of the canal. If so, passive devices, such as a shallow berm along the shoreward side of the ditch or other water retention devices should be investigated. Active devices to pump, retain, or control the flow of water may also be effective. Creating slight depressions along the shoreline would also aid in retaining water along the shore. A water budget should be developed that balances water input and output for the wetland type to be developed along the shoreline.
- **Plants:** the plants that colonize a wetland come from many sources. Wind, water, and animals disperse seed or plant fragments, or man can plant them. Perhaps one of the most important seed sources for an area like the shoreline in the project area is the existing seed bank in the soil. Because the area was previously an emergent wetland, viable seeds and vegetatively reproductive plant parts remain in the soil. Dr. Charles E. Herdendorf identified 50 species of wetland plants during a September 2001 survey of the Barnes Nursery project area (Herdendorf, C.E. 2001. Vegetation survey of the Barnes Nursery

Project East Sandusky Bay, Erie County, Ohio — September 7, 2001. Unpublished). Bissell and Finni surveyed the project area by walking along the bay shoreline of the spoil pile and along the mudflat south of the channel. Additional species observed in both locations included *Scirpus validus* (soft-stem bulrush), *Scirpus fluviatilis* (river bulrush), *Pontederia cordata* (pickereel weed), *Eleocharis engelmannii* (Engelman s spike-rush), *Eleocharis erythropoda* (red-stemmed spikerush), *Eleocharis intermedia* (spikerush), *Polygonum pensylvanicum* (Pennsylvania smartweed), *Rorippa palustris* (common yellow cress), and *Cyperus diandrus* (umbrella sedge). *Sagittaria cuneata* (northern arrowhead) was observed only along the bay shoreline but not on the mudflat south of the channel, whereas *Juncus torreyi* (Torrey s rush), *Salix eriocephala* (heart-leaved willow), *Aster simplex* (panicked aster), *Potentilla anserina* (silverweed), *Potentilla paradoxa* (bushy cinquefoil), and *Lobelia siphilitica* (great blue lobelia) occurred on the mudflat. (See Appendix, Exhibit C for complete plant list)

However, some time has passed since the area was last a healthy emergent wetland, reducing the likelihood of the seed bank in the soil spontaneously producing a wetland with a highly diverse assemblage of species. It is more likely that early successional species will colonize the area and that with time nature will produce a more diverse wetland.

Seeding, planting, and/or use of soil containing seeds/plant parts may be helpful in re-establishing a desirable species complement. The area may need to be prepared for seeding or planting, and control of undesirable species may be required.

Many invasive, exotic species are early successional colonizers, and when established, may out-compete native species that produce later seral stages, and thus sustain an un-healthy near monoculture. This is especially true in disturbed or less natural areas. Common reed (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*) are two of the best known and most difficult to control. Both were observed in the shoreline wetland. Runners (a major form of vegetative reproduction) of the common reed over 20 feet in length were observed. Control of species such as common reed and purple loosestrife may be required, especially when conditions favor the invasive species over the more desirable/natural species.

2. Will wetland plants colonize the slopes of the island, forming several community zones?

Management practices implemented for the island will ultimately determine the plant community composition and zones. We believe that the primary function of the island will be to protect the wetland plant community developing along the southern shoreline and in the channel, i.e., emergent wetland on the southern shoreline and submerged, floating, and emergent community in and paralleling the channel.

During the September 7 reconnaissance, it was noted that spoil placed on the island resulted in steep bank slopes from the crest of the island to its base (Appendix, Exhibit D) and that much of the silty clay loam excavated from the channel was well drained and lacked organic matter that could provide a seed-bank and enhance retention of water (Appendix, Exhibit E). Measures that could be implemented to improve the gradual changes from lower to higher areas are:

- Make the slopes gentler. In general, the longer the slope, the greater the opportunity for zones to form.
- Improve the soil. At this time, the soil is very poor in terms of its nutrients and its ability to hold water — it lacks organic material. It is a harsh environment, that is essentially dry to the water's edge. It does not provide an environmental gradient that would lead to a change in species composition (zoning).

As a part of the application, Barnes Nursery proposed to grade the spoil slopes to a 4:1 ratio and to provide soil conditioning and augmentation as necessary. This will increase water-holding capacity, provide nutrients, and provide greater opportunity for development of a more diverse plant community.

3. Will the open bay, offshore of the island, become vegetated by emergent plants despite the fact it is not protected from wave disturbance, as is the interior side of the island?

During the field reconnaissance it was noted that the majority of East Sandusky Bay lacked water and, for the most part, lacked wetland vegetation (Appendix, Exhibit F). A notable exception was emergent vegetation in some areas south of the barrier island. This area is protected from wave action off Lake Erie and presumably from wave action within East Sandusky Bay when the Bay is flooded. An area at least 500-foot wide north of the spoil island paralleling Barnes Nursery irrigation canal lacked emergent vegetation. Factors that may contribute to the lack of vegetation in this area include persistent wave action when East Sandusky Bay is flooded, winter kill of aquatic vegetation resulting from frost penetration of Bay sediment during winter, and/or damage by spawning carp and other fish species that increase turbidity or uproot plants.

By contrast, placement of spoil during channel construction has protected the channel and shoreline from the forces of the waves. This is a significant change in the physical environment, and it is probable that the protected area will differ from the open bay. Without the waves, emergents can become established and grow. Indeed, emergent plants and other vegetation are already becoming established on the shoreline side of the spoil (Photograph 1). The Barnes Nursery project will have no effect on the Bay north of the irrigation canal. If wave action has destroyed and/or prohibited establishment of

emergents in the bay, then wave action will continue to prevent, destroy, and/or prohibit their establishment (Appendix, Exhibit G).

Creating breaches in the spoil pile to form islands will assist plant seed dispersal. During normal flushing of the Bay, seed from plants growing along the south shoreline will have an opportunity to wash into East Sandusky Bay.

4. Will the island(s) and channel provide habitats for a diverse community of birds and other animals?

The management alternative(s) selected for the vegetative community in the project area will affect utilization of the area by birds and other animals. Several management strategies are possible that fall along a continuum for production of a desired endpoint:

- **No management** — allow nature to select the species complement and diversity
- **Manage for the prevention of nuisance species** — avoid production of habitats (vegetation and physical features) that attract undesirable species, such as Canada geese and species of gulls
- **Manage for one or a few desirable species** — produce vegetation and physical features attractive to specific species, such as game or endangered species
- **Manage for greatest diversity** — which is the most probable outcome of producing a variety of physical features and a diversity of vegetation types
- **Fill the channel**

A no- or low-management alternative is most likely to be successful over time. If a no- or low-management alternative is effective for control of nuisance species and/or to attract desirable species, then it is the most practical choice. Among no- or low-management considerations are the following.

High shoreline area transition to upland: Cottonwood and bur oak should be encouraged to colonize this area to provide a canopy to shade out *Phragmites australis* and other undesirable exotics at the high-water line.

Mud flat: Manage for *Phragmites australis*, narrow-leaf (*Typha angustifolia*) and hybrid (*Typha glauca*) cattail, purple loosestrife, and canary grass and encourage development of giant bur-reed on the mud flat. The habitat could be improved by making slight depressions in the mud flat that would retain water for an extended period. The marsh that should develop would include giant bur-reed, arrow-head, southern blue flag, soft stem bull rush, and river bull rush. A rare ephemeral community could be restored on the flats by opening of the marsh by plowing or removal of the reed community.

Dike area: Breach the dike to allow exchange of water between East Sandusky Bay and Barnes Nursery intake canal. Water exchange will enable exchange of seed from plants growing in the south shoreline mud flat with those growing in the Bay. Sandbar willow (primary) and heartleaf willow could be encouraged to grow on the top of the dike to develop a shrub canopy while heartleaf willow could be encouraged to grow at water s edge. Both willows will stabilize the islands and minimize shoreline erosion.

Another no- or low-management alternative strategy could be to allow or enhance continued development of eastern cottonwood trees (*Populus deltoides*) seedlings that have colonized the spoil pile, as observed on the island during the September reconnaissance. Although now seedlings, they will develop to mature trees. Stands of cottonwood trees would be desirable in several ways:

- They are relatively incompatible with use of the island by Canada geese, and gulls, which are a nuisance in many communities or are undesirable for their adverse effects on an endangered species (piping plover)
- They are favored perching and roosting sites for bald eagles, an endangered species, and other raptors when situated along water bodies and separated from human disturbance
- They provide perching and stop-over habitat for migrating neotropical song-birds
- Their root masses would help protect the physical integrity of the islands

Fill the Channel and Return it to its Former Condition: This management alternative would result in loss of:

- Permanent fish and macro- and micro-invertebrate habitat in the channel
- Summer and winter aquatic refugia for fish and invertebrates when Sheldon s Marsh is dewatered or frozen
- Wildlife habitat on the dike
- Shoreline protection afforded by the islands
- Wetland seed bank and established plant community along the southern shore

We believe these are generally negative effects. All represent a loss of wildlife or fisheries resources propagated by a loss of habitat. The benefit, or loss, realized is in proportion to the size of the area, which is relatively limited.

During the September field reconnaissance, the majority of Sheldon s Marsh was a mud flat, the product of continuous offshore winds (Appendix, Exhibit H). Standing water near the breach in the barrier island (Appendix, Exhibit I) and in the channel constructed by Barnes Nursery provides the only permanent submerged habitat in the Marsh that can sustain fish and other aquatic species such as invertebrates. The channel will provide incrementally to the foraging habitat for eagles. It is away from the condominiums, the noise and lights associated with the traffic on the causeway and disturbance by people using Sheldon Marsh State Nature Preserve. The channel will provide habitat under ice cover for fish using shallow shoreline habitat during winter. The island(s) will also provide terrestrial habitat for a variety of species. For example, a variety of insects were observed on vegetation growing on the islands during September. The insects and habitat on the island(s) may support passerine birds during spring and autumn migration. Should the island be removed, this incremental addition to the region s resources would disappear.

An important feature of the island(s) along the Barnes Nursery channel is the protection they provide to the wetlands between the channel and the shore. The islands protect the wetland from onshore winds that have reduced the emergent wetlands of Sheldon Marsh to a mudflat. It is likely that the value of this protected area may increase in the future for its contribution to the seed bank of Sheldon Marsh if the barrier island is lost.

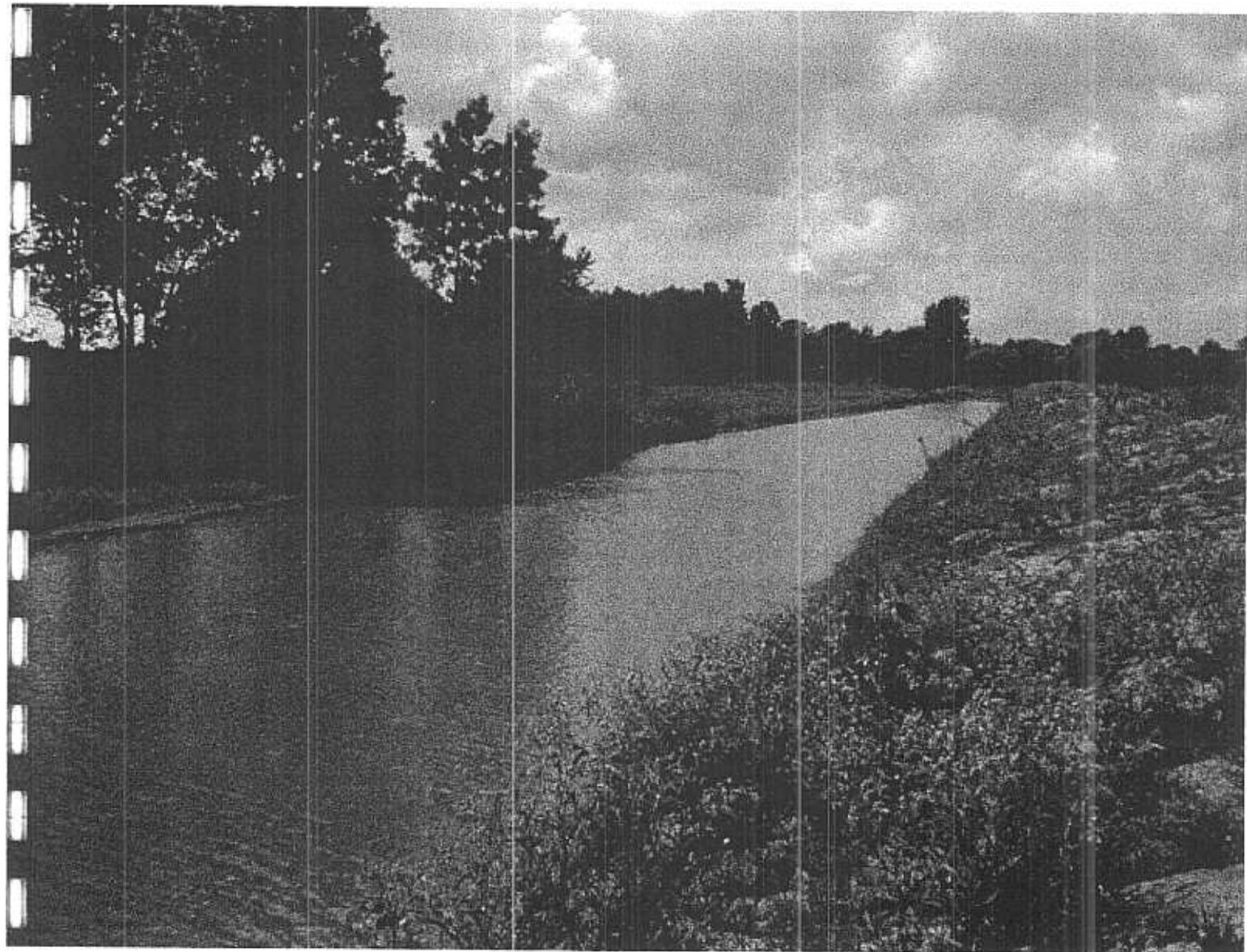
Barnes Nursery obtained a permit to place dredge spoil immediately adjacent to and north of the channel. After this activity, vegetation between the channel and the shore is substantially better than on the mud flats of Sheldon Marsh. Returning the fill forming the islands to the channel would produce an area equivalent to the islands and the channel that is nonproductive and susceptible to erosion. In addition, the wetlands that have formed between the channel and shore will be reduced or lost because of the wind-induced wave action. Wave-action will suspend fine sediment from the filled channel, with an over-all detrimental effect on the Marsh.

Because more than one management alternative exists, Barnes Nursery should encourage natural resource agencies and other interested parties to participate in guiding the management plan(s) for the project area. Barnes Nursery should plan to manage the area in harmony with the collective natural resources of Sheldon Marsh. By management and careful monitoring, Barnes Nursery will impede the invasion of exotic species that could out compete the native wetland plant community. As identified by the U.S. Fish and Wildlife Service in their September 28, 2001 letter, invasive species often form a monoculture that cannot be out competed by native vegetation. Therefore, a collective concerted effort is required by all stakeholders involved in management of the Marsh. Without this effort, it is possible that major portions of the Marsh lateral to the Nursery may become a source for exotic plants that out compete native plants on the managed Barnes Nursery area. To be successful, management of exotics must be part of an overall effort for the entire Marsh.

5. Will the reservoir channel provide refugia for fish species when the open bay is dry or frozen to the bottom?

During the September reconnaissance, the Barnes Nursery irrigation channel provided the only deep-water habitat in the southern three-quarters of East Sandusky Bay. Water was also observed near the barrier island where the emergent plants were located, and near the old channel into which the Nursery proposed to make a connection. The existing channel, and its connector to the Black Channel remnant may provide the only areas that do not dry out in the Bay. Thus, the Nursery channel is one of a limited number of permanently wet refugia in East Sandusky Bay and the only refugium along the southern shoreline for species that cannot survive drying during spring, summer, and autumn. Because of its depth, we anticipate that the channel will not freeze to bottom during winter; thus, the channel will provide a refugium for protection of aquatic species from drying and freezing.

6. Will a diverse community of fish inhabit the reservoir channel?



Photograph I

September 2001, looking West (South West) a bng channel.

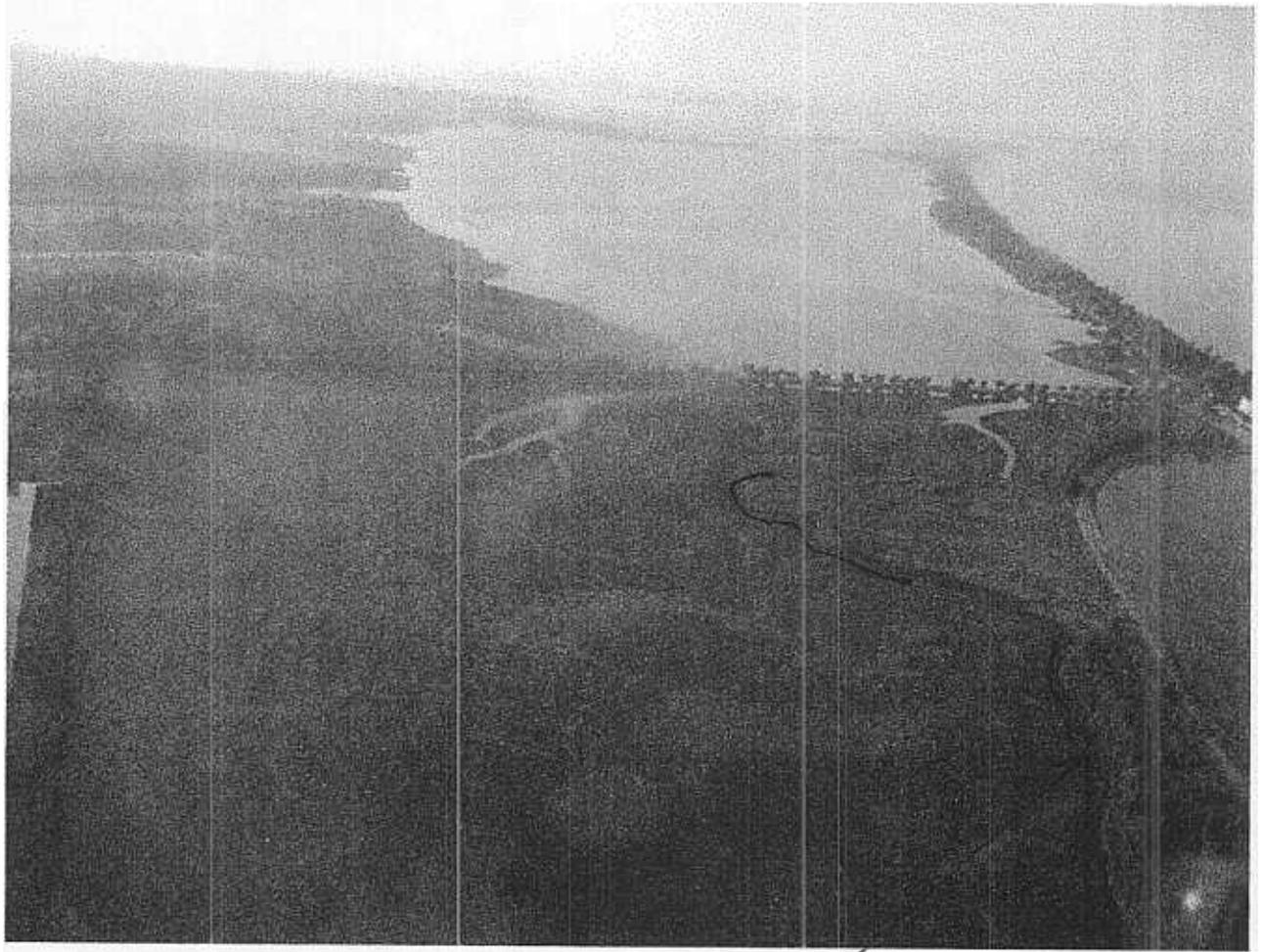
Vegetation had filled south shore of channel



Addendum

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Exhibit A Sept 2001, looking West
Spoil area & shoreline vegetation.
Open bay to North, mudflat.



Addendum
Exhibit B - Aug 2001
Looking W - Notice vegetation on
the south side of barrier beach

**VEGETATION
EAST SANDUSKY B**

SCIENTIFIC NAME

- 57. *Scirpus fluviatilis*
- 58. *Scirpus validus*
- 59. *Solanum dulcamara*
- 60. *Solidago canadensis*
- 61. *Sparganium eurycarpum*
- 62. *Trifolium pratense*
- 63. *Typha angustifolia*
- 64. *Verbena hastata*

RELATIVE ABUNDANCE

- A — Abundant
- C — Common
- O — Occasional
- U — Uncommon

Field collection and identification
Species identification verified by
Additional collection and identification

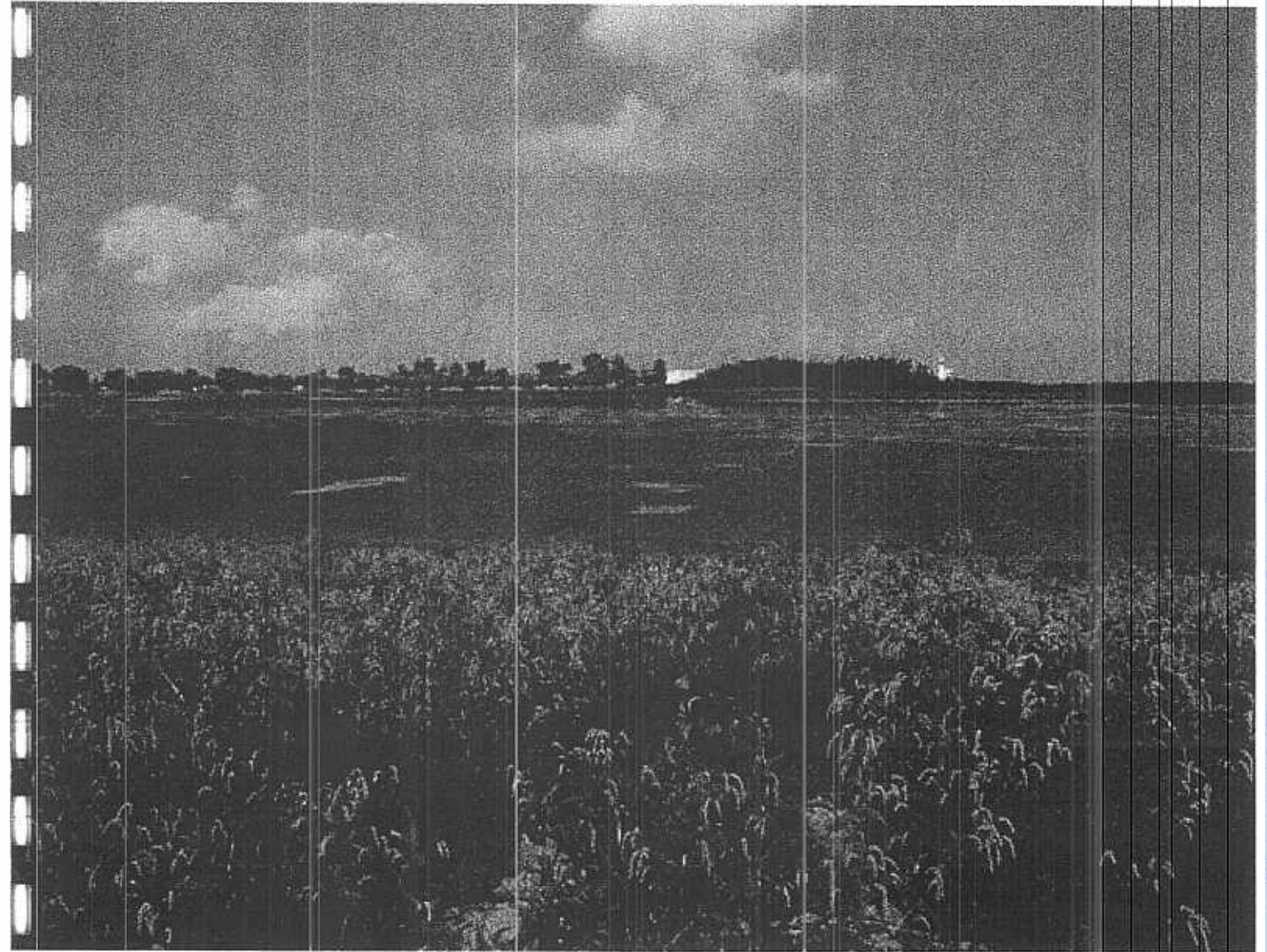
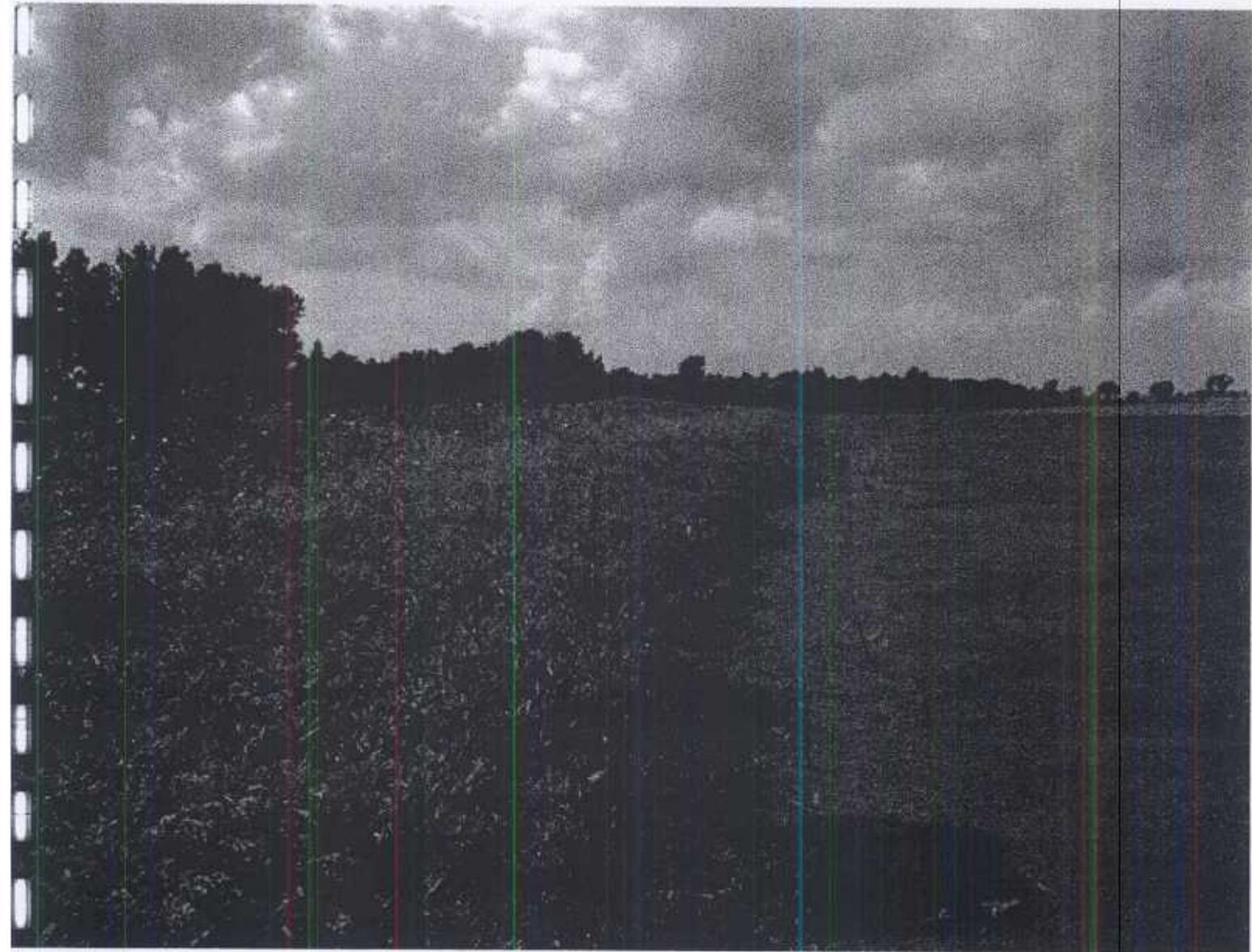


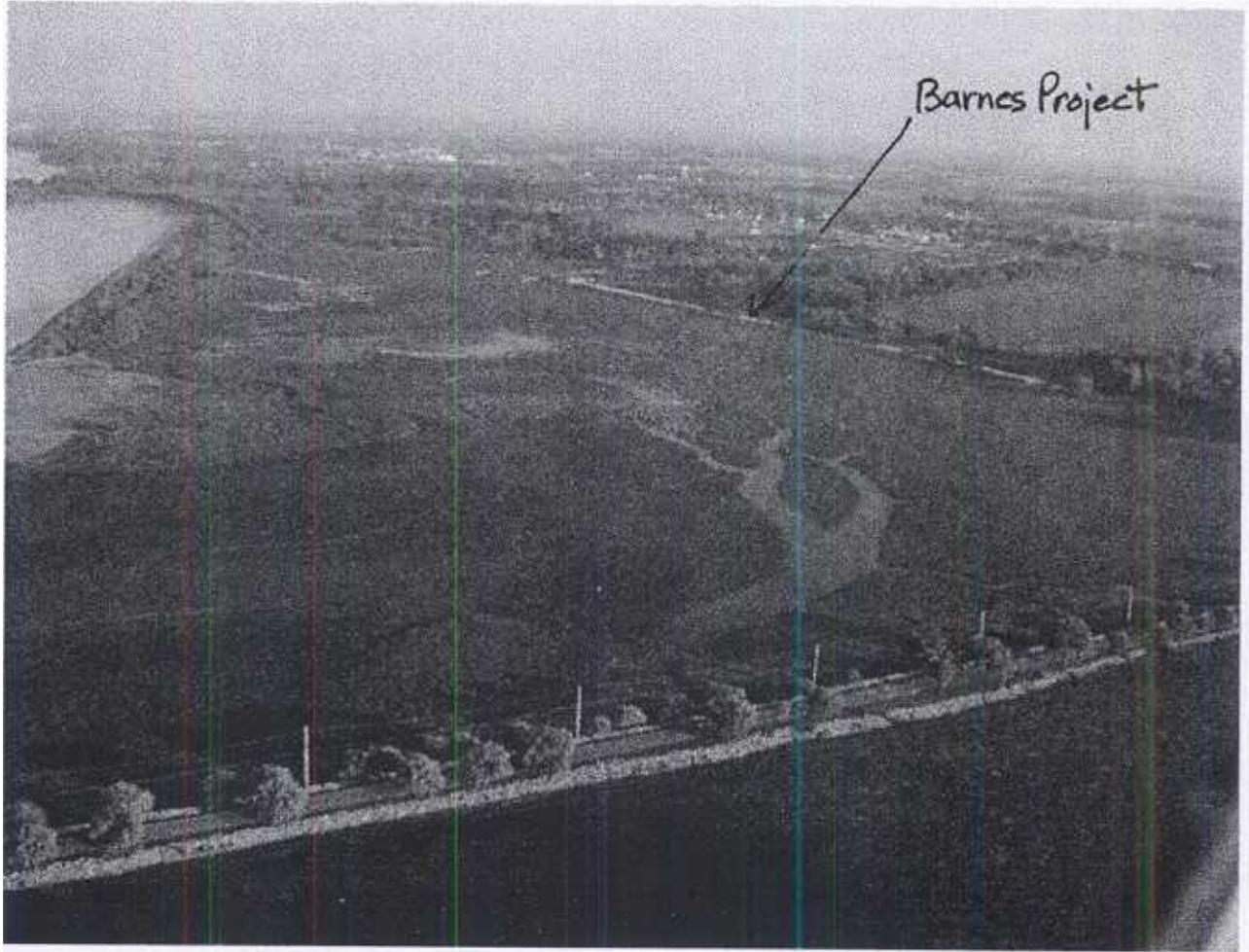
Exhibit F

Sept 2001, looking N

Note water drains away from the shoreline making it impossible to draw water in low water conditions.



Appendix G Sept 2001, looking W
shoreline between Barnes & State
Nature Preserve. Wave action has
prevented the vegetation from moving
north into the bay



Appendix H
August 2001, Looking E
Shows East Bay mudflat, with
natural forming channel.

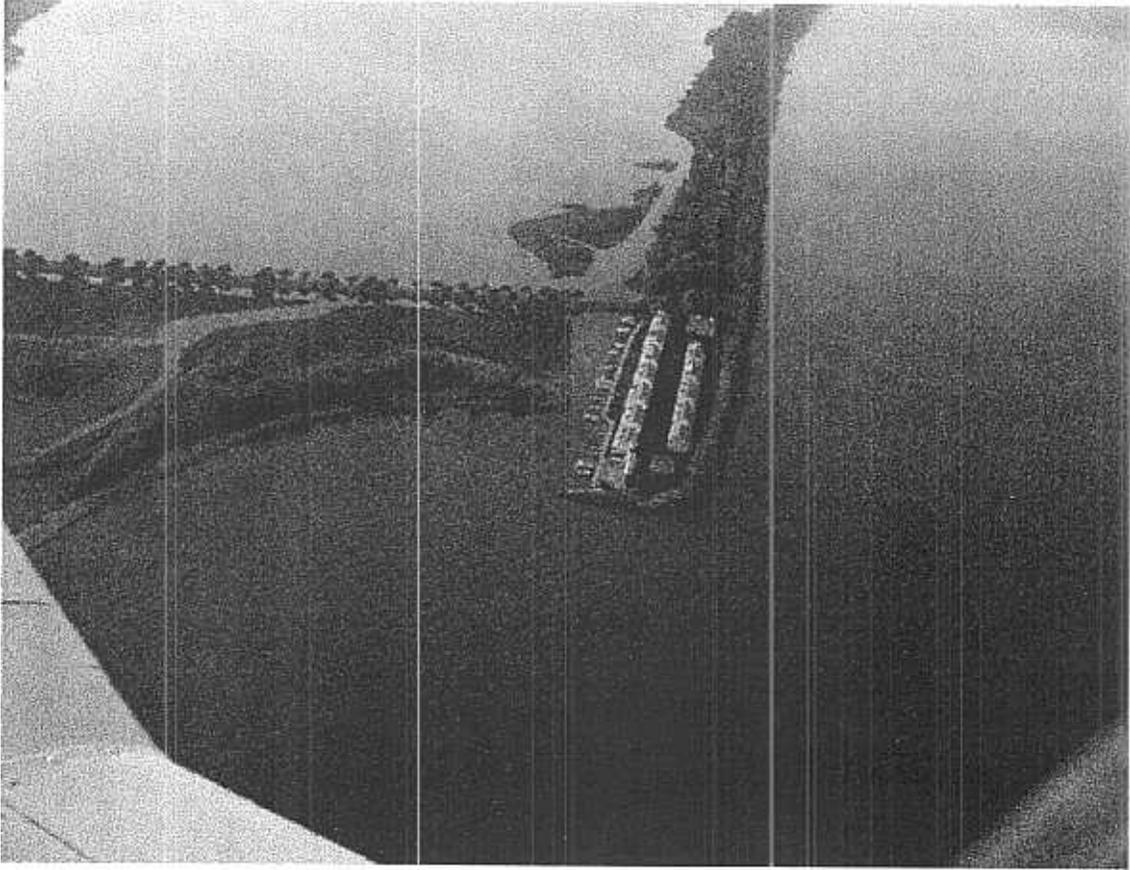


Exhibit H This photograph shows the breach in the barrier beach where the water flows from Lake Erie, into and out of East Sandusky Bay.

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