

Introduction

Location of Mitigation Project

Big Cypress National Preserve

Naples

Fort Lauderdale

Miami

**Siting Map of South Florida
with major transportation routes**

0 10 20 30 40 50 60 70 80 90 100 Miles

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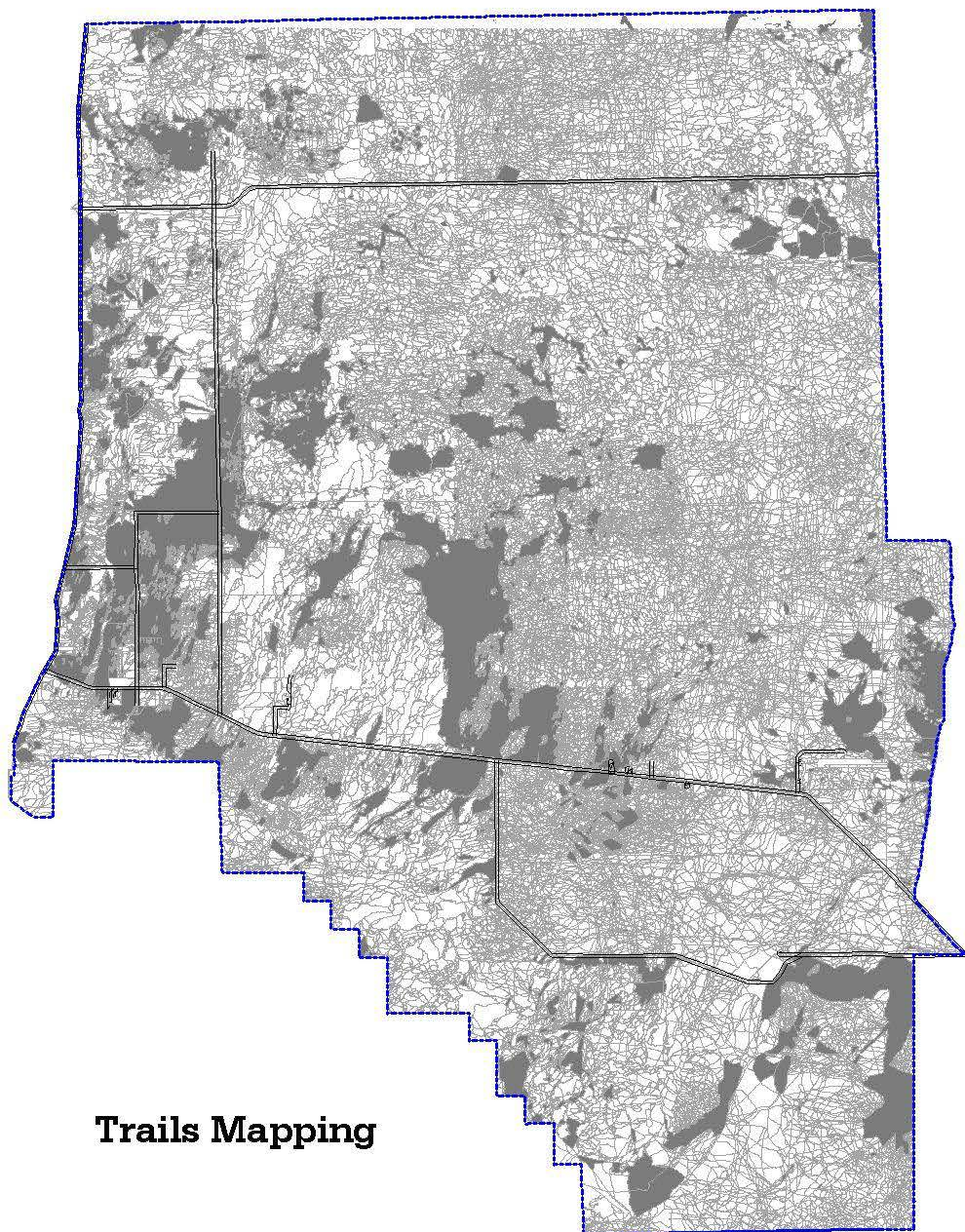
Off Road Vehicle (ORV) Activities

Use of off road vehicles in the Big Cypress region occurred for several decades before the Preserve was established, so that consideration for continued use was made during the Preserve's creation. Legislation that established Big Cypress National Preserve in 1974 recognized the use of off road vehicles as an activity that was acceptable within the Preserve; however, provisions were made in this legislation to regulate this activity. In recent years off road vehicle use has increased significantly because of increased population, better automobile components, and sophisticated electronic mapping and communication devices. This increased use has resulted in a system of ORV trails that allows vehicle access to virtually all parts of the Preserve. Many of the trails are seldom used and have probably not significantly compromised natural communities within the Preserve, but in areas of intense ORV use much habitat alteration is evident.

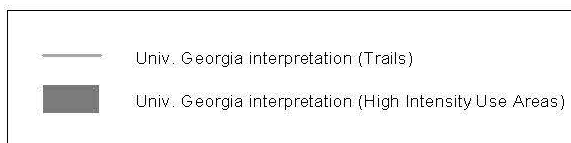
Requirements to Limit ORV Activities

In 1995 Big Cypress National Preserve settled a suit by The Florida Biodiversity Project with an agreement to create an ORV management plan. Florida Biodiversity alleged that several federal agencies and bureaus failed to comply with federal statutes, including the Clean Water Act, the Endangered Species Act, and the National Environmental Policy Act (NEPA), largely by failing to adequately regulate ORV use in the Preserve. In response, the Preserve produced a management plan that provides guidance and regulation for recreational off road vehicles; this plan was approved in 2001.

A primary component of this plan will restrict travel of ORVs to a designated trail system. This will significantly increase traffic on major trails, so that these trails will need to be reinforced (stabilized) to withstand this additional use. Other natural areas that had much traffic for many years before these restrictions will now have opportunity to recover. The areas that were altered by former ORV traffic are expected to become dominated by native wetland species, and to undergo subsequent colonization and succession by native wetland components. Big Cypress National Preserve anticipates monitoring changes to these wetlands, and other native communities associated with similar restoration projects. This monitoring will produce information valuable for future projects and indications of whether remediation may be necessary.



Trails Mapping

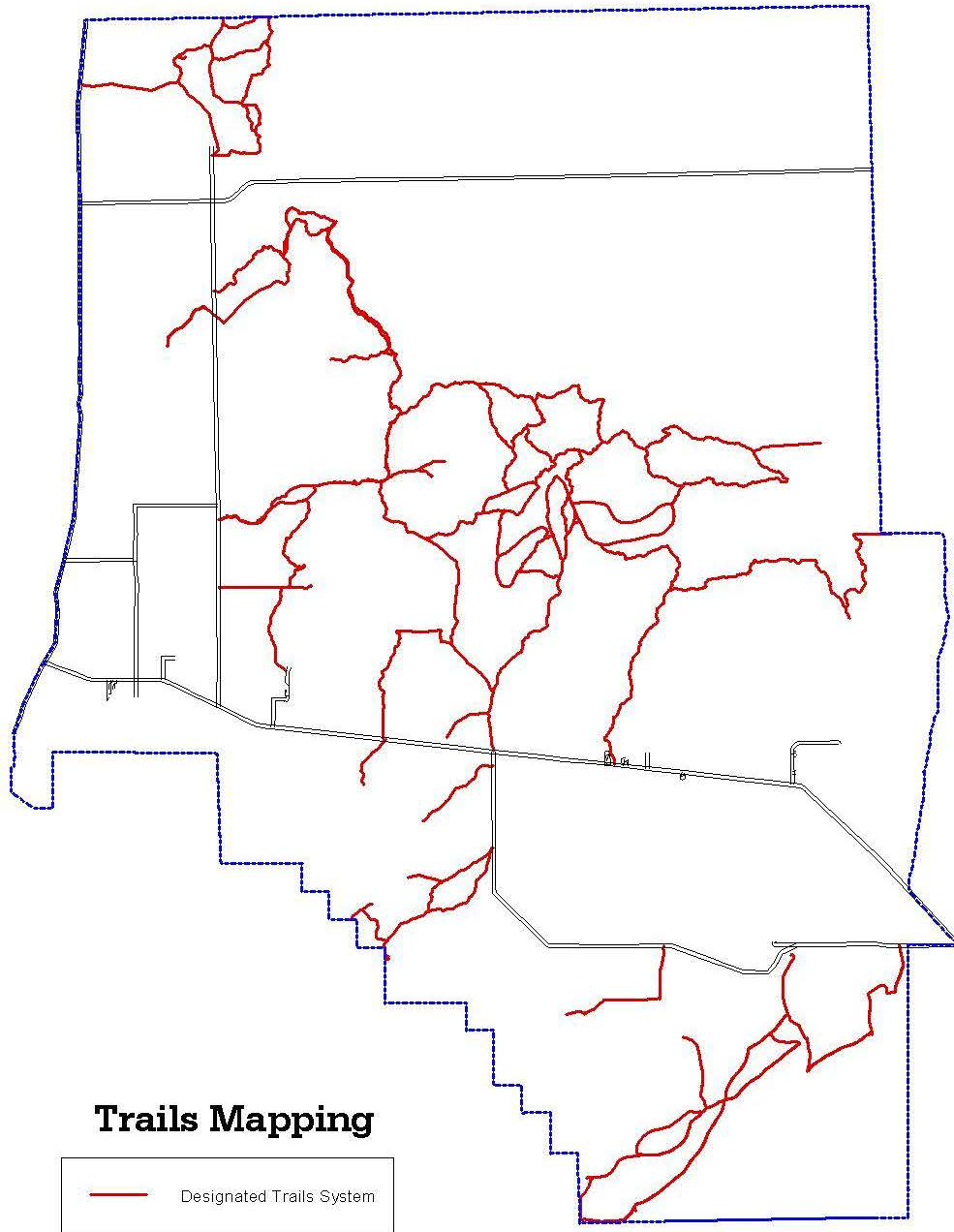


Big Cypress National Preserve

Jim Burch, Vegetation Specialist

BICY-GIS 1/8/02

Former ORV Trail System in Big Cypress National Preserve. Gray lines are trails that were mapped in the late 1990s. Solid gray areas are areas with trails too numerous to map; most of these areas are seasonally wet prairies. Total distance of mapped trails is estimated at 23,000 miles, not counting areas with trails too numerous to map.



Big Cypress National Preserve

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BICY-GIS 1/8/02

Off road vehicle trails network in Big Cypress National Preserve. This trail system is part of the approved ORV Management Plan for the Preserve. These designated trails are estimated to total 400 miles. About 300 miles of this system will be placed onroads that existed before the Preserve was created; about 100 miles is expected to require stabilization.



ORV trail test area. Crew installing Geoweb over Geotextile matting, one of the methods investigated in strengthening ORV trails in high traffic trail areas.

Background: Preliminary Tests and Recommendations for Restoration

In 1999 and 2000 Big Cypress National Preserve and EPA conducted test treatments in two small areas to investigate several methods of ORV trail stabilization. At the same time prairie restoration test areas were established adjacent to the stabilized trails. In each area, a section of the prairie adjacent to the trail was treated by flattening the ground surface by driving low PSI, rubber-tracked vehicles over the area to level the ruts that had been produced by ORV traffic. Another section was allowed to undergo succession without ground surface preparation. In all areas plant recruitment was allowed to occur naturally, and with no further human alteration. These areas were allowed to recover for ca. one year. Both areas were examined and vascular plant densities and diversities were compared. The results of the analyses of these tests is summarized below; the complete report that describes the tests, results, and analyses accompanies this document (Trail Reinforcement and Off Road Vehicle (ORV) Use in Big Cypress National Preserve).

Long-term Trail Strengthening

Trail reinforcement using Geoweb with bedding rock and Geotextile mat appear to be the most effective at strengthening trails; in areas with potentially large volumes of

water movement, larger bedding rocks may be able to stay in place with ORV traffic. This type of trail reinforcement can be placed on trails with the final trail grade the same as surrounding grades, so that flow of water in the area will not be inhibited. This method also appears to be most cost-effective. Initial labor and materials costs are moderate, but maintenance appears to be lower than most of the other alternatives examined.

Short-term Trail Strengthening

Trail reinforcement with crushed limestone provides a fast and inexpensive trail surface. However, this method carries many adverse considerations; 1) Crushed limestone material will be displaced by ORV traffic and will require frequent maintenance and additional fill. 2) This will elevate the roadbed so that movement of water is inhibited. 3) Growth of plants in the areas covered by crushed rock will allow little growth of native plants. 4) Crushed limestone can cause turbidity in surrounding surface water. Crushed limestone should be used only in emergency situations, when trail strengthening is needed quickly. This material should be removed so that the elevation of the trail area is returned to former elevation to allow water movement as soon as a decision is made regarding long-term management of the trail, and subsequent work, if any, is initiated.

Leveling Rutted Prairies

In this preliminary study, both areas that have been rutted by ORV operations, and areas that have been rutted by ORV operations and subsequently leveled, appear to be dominated by ground cover species commonly found in marl prairie communities. Areas that were not leveled appear to be covered by ground cover that is more dense than in the leveled areas. Ground cover in the leveled areas appears to be less dense than in the non-leveled areas, and may be dominated more by ruderal (weed or early colonizing) species. Both areas appear to be undergoing successional change of native plant communities after disturbances. After one year of succession, the leveled areas appear to have lower densities of ground cover than the non-leveled areas.

It will be very important to establish detailed study of marl prairies and other communities, so that when restrictions of ORV use occur, changes in biological communities can be monitored. As disturbance by ORV use abates, “ecological release” by many of natural habitats in the Preserve can occur. When this happens, many species may proliferate in areas soon to be without the mechanical disturbance that has been part of the community for several decades. This may allow abundant growth of many native species that are common soon after disturbances. This may be considered a natural, early successional part of re-colonization by native species in a natural system. This is largely an unknown or uncertain natural process that will allow much opportunity for descriptive ecology as the process occurs. This will also be very important for other areas with similar user concerns, or other Preserves with similar questions about successional changes in natural communities. However, as this occurs, abundant opportunity also will exist for colonization by many non-native (and un-natural to this suite of habitats – i. e., “exotic”) species. It will therefore be critical to monitor these areas for infestations by exotic species that are common to disturbed habitats in this area. As part of habitat

recovery and resistance to potential displacement by exotic species, habitat restoration measures, including exotic removal and planting of appropriate native species should be considered.

Analysis of ORV Trail Treatments

Treatment

Wood corduroy

Advantages:

- allows plants more area to grow
- good on deep unconsolidated soils
- allows water movement

Disadvantages:

- expensive to build and maintain
- doesn't last long
- can float in high water
- can become hazardous on shallow, unconsolidated soils

Geoweb with Bedding Rock and Geotextile Mat

Advantages:

- can be constructed at surrounding grade to allow water movement
- good on deep or shallow unconsolidated soils
- moderately expensive
- low maintenance

Disadvantages:

- limited plant growth in trail

Geoweb with soil on Geotextile Mat

Advantages:

- allows a little plant growth

Disadvantages:

- textile breaks down with ORV traffic
- soils are displaced with ORV traffic

Crushed limestone fill

Advantages:

- inexpensive, can be installed quickly

Disadvantages:

- inhibits water movement
- becomes displaced outward by ORV traffic, requiring more material
- requires frequent maintenance (above)
- allows very little plant growth
- causes turbidity

Geoweb with Large Bedding Rock and Geotextile Mat

Advantages:

- can be constructed at surrounding grade to allow water movement
- good on deep or shallow unconsolidated soils
- may hold up against water movement better than smaller rocks

continued

Disadvantages:

- allows essentially no plant growth

- may break down with traffic

Analysis of ORV Trail Treatments (continued)

Treatment

Geotextile with Soil

Advantages:

- less expensive than Geoweb with Geotextile mat
- allows water movement

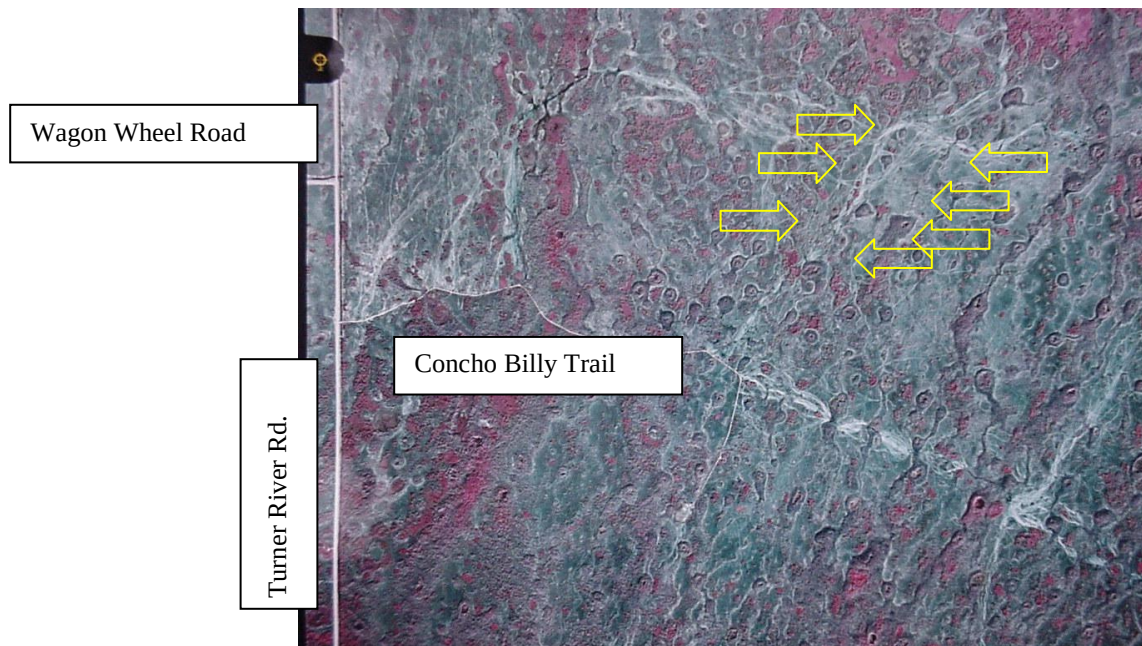
Disadvantages:

- does not hold up with ORV traffic
- ORV operators seek alternate routes
- virtually no plant growth in the trail and surrounding areas

Operation of Tracked Vehicles

Operation of tracked vehicles has been prohibited in Big Cypress National Preserve for several years. The administratively excepted use of tracked vehicles equipped with treads to minimize ground pressure and other impacts to natural communities indicated that these vehicles can be modified and operated so that impacts to natural communities can be minimized. However, as these vehicles are now restricted from use in the Preserve, their use in the Preserve should occur only as service and maintenance equipment under administrative exception. Standards and criteria for their use in the Preserve should be developed.

Northeastern corner of USGS Ochopee Quadrangle map with Concho Billy Trail area indicated. The location of the approximately sixty acre Off Road Vehicle trail restoration area is outlined with yellow arrows.



False color infra-red satellite imagery of the Concho Billy Trail area. The location of the approximately sixty acre Off Road Vehicle trail restoration area is outlined with yellow arrows. Other trails and areas heavily used by off road vehicles produce light colored registers on this imagery.

Vegetative Sampling.

Percent plant cover for Baseline was estimated with photographs and limited site inspection and Time Zero restoration stage was estimated with quadrat and transect cover measures. Percent cover for Year One will be estimated with transect and quadrat cover measures in late spring 2002 (Table 1.).

Table 1. Concho Billy Off Road Vehicle Trail Restoration site: common vascular plant species.

Species:	Time:	Baseline	Time Zero
	Estimated Percent Cover:		
<i>Agalinis</i> sp.		<10	1
<i>Annona glabra</i>		<1	*
<i>Aster bracei</i>		<1	*

<i>Bacopa caroliniana</i>	<10	*
<i>Cassytha filiformis</i>	<1	*
<i>Cladium jamaicense</i>	10	3
<i>Crinum americanum</i>	<10	2
<i>Dichanthelium</i> sp.	<10	*
<i>Dyschoriste angulata</i>	<1	*
<i>Eleocharis geniculata</i>	<1	*
<i>Elytraria caroliniana</i>	<1	*
<i>Eragrostis elliottii</i>	<10	*
<i>Flaveria linearis</i>	<10	*
<i>Heliotropium polyphyllum</i>	<1	*
<i>Hymenocallis palmeri</i>	<10	*
<i>Iva microcephala</i>	<1	*
<i>Juncus megacephalus</i>	<1	*
<i>Mitreola sessilifolia</i>	<1	*
<i>Muhlenbergia capillacea</i>	10	*
<i>Panicum repens</i>	<10	2
<i>Panicum tenerum</i>	<10	3
<i>Paspalum monostachium</i>	<10	2
<i>Phragmites australis</i>	<1	*
<i>Pluchea odorata</i>	<10	*
<i>Proserpinaca pectinata</i>	<1	*
<i>Rhynchospora divergens</i>	<10	4
<i>Rhynchospora</i> sp.	<1	*
<i>Sabatia grandiflora</i>	<1	*
<i>Schizachyrium rhizomatum</i>	<10	*
<i>Setaria geniculata</i>	<10	*
<i>Solidago stricta</i>	<1	*
<i>Taxodium distichum</i>	1	*

* species noted as present, but not sufficiently common to estimate cover.

Photographic Documentation.

Restoration sites southeast of Concho Billy Trail (May 2001). One site (left) was prepared by leveling wheel ruts without mixing the surface soils with deeper substrates; another area (right) was left with no surface preparation. Both will be left to allow natural establishment, recruitment, and succession of plants. Plant cover and diversity will be monitored in each area.



Restoration sites southeast of Concho Billy Trail (May 2001). Aerial aspects of the restoration site with substrate prepared by leveling wheel ruts (left), and the restoration site with no substrate restoration (right). Each of these sites is identified for photo-documentation so that subsequent photos of each area can be made to compare growth of plants and succession.

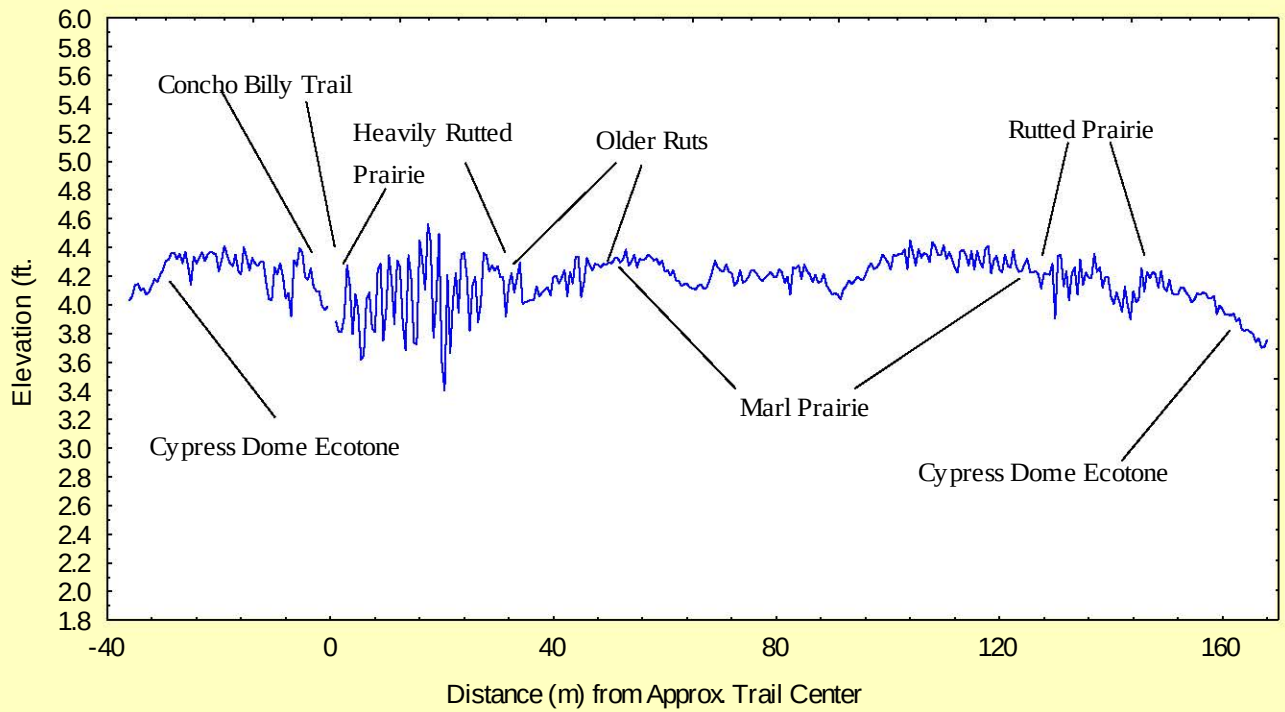


Restoration area with treatment by leveling ground surface southeast of Concho Billy Trail (May 2001). Treatment of this area was done by driving low PSI rubber-tracked vehicles over the area to level the ruts that had been produced by ORV traffic while the soil was inundated or saturated with surface water. The 100 m X 100 m quadrat test area is outlined with white marks on the ground at 20 m intervals around the periphery. A north arrow is near the center of the quadrat for orientation.

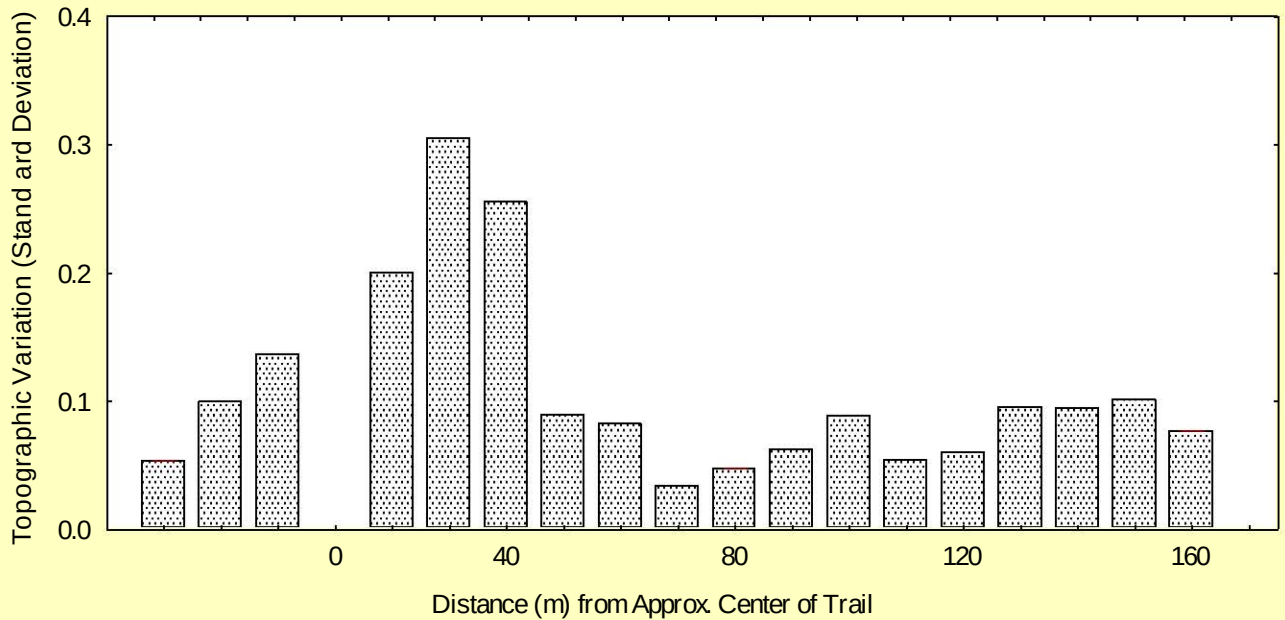


Restoration area without treatment southeast of Concho Billy Trail (May 2001). Recovery of this area will proceed without treating the soil ruts caused by ORV traffic. The 100 m X 100 m quadrat test area is outlined with white marks on the ground at 20 m intervals around the periphery. A north arrow is near the center of the quadrat for orientation.

Concho Billy Trail, Transect 1. May 2001

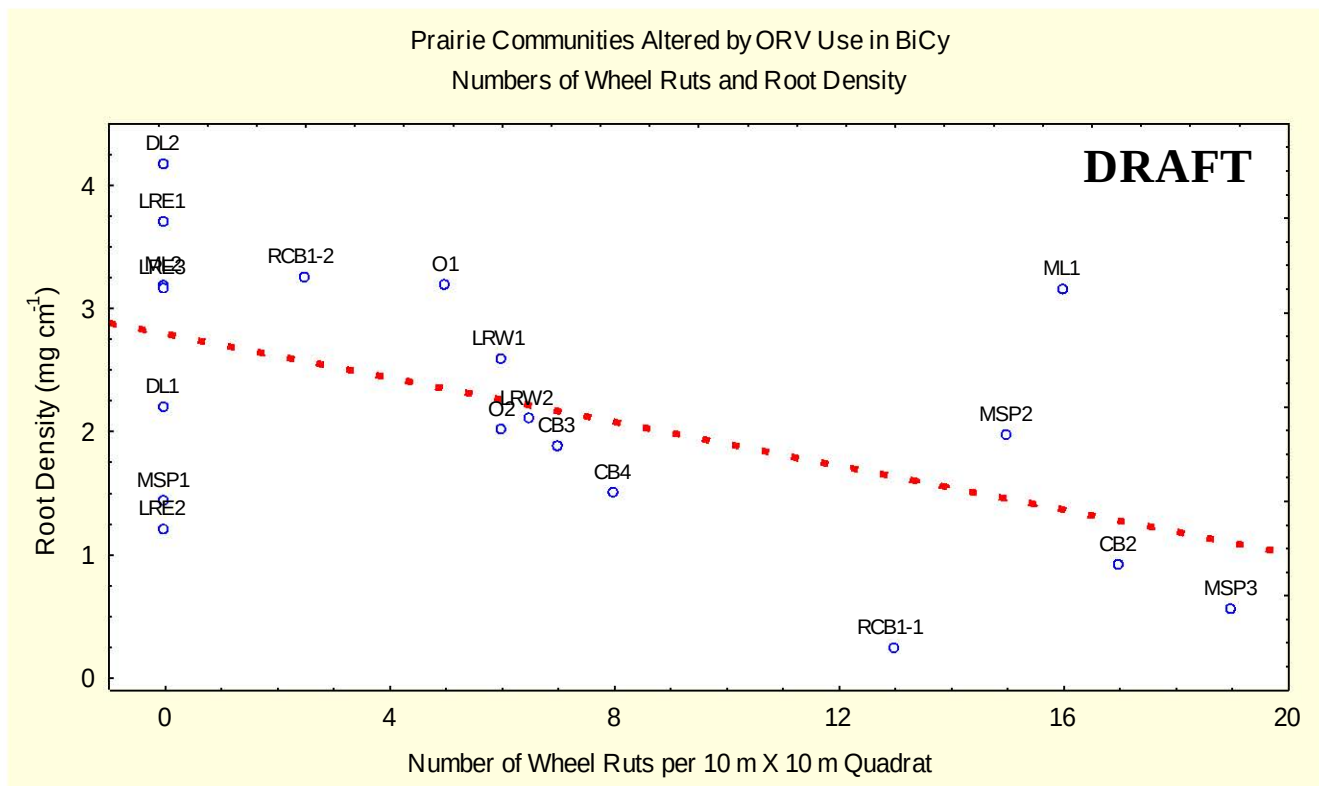
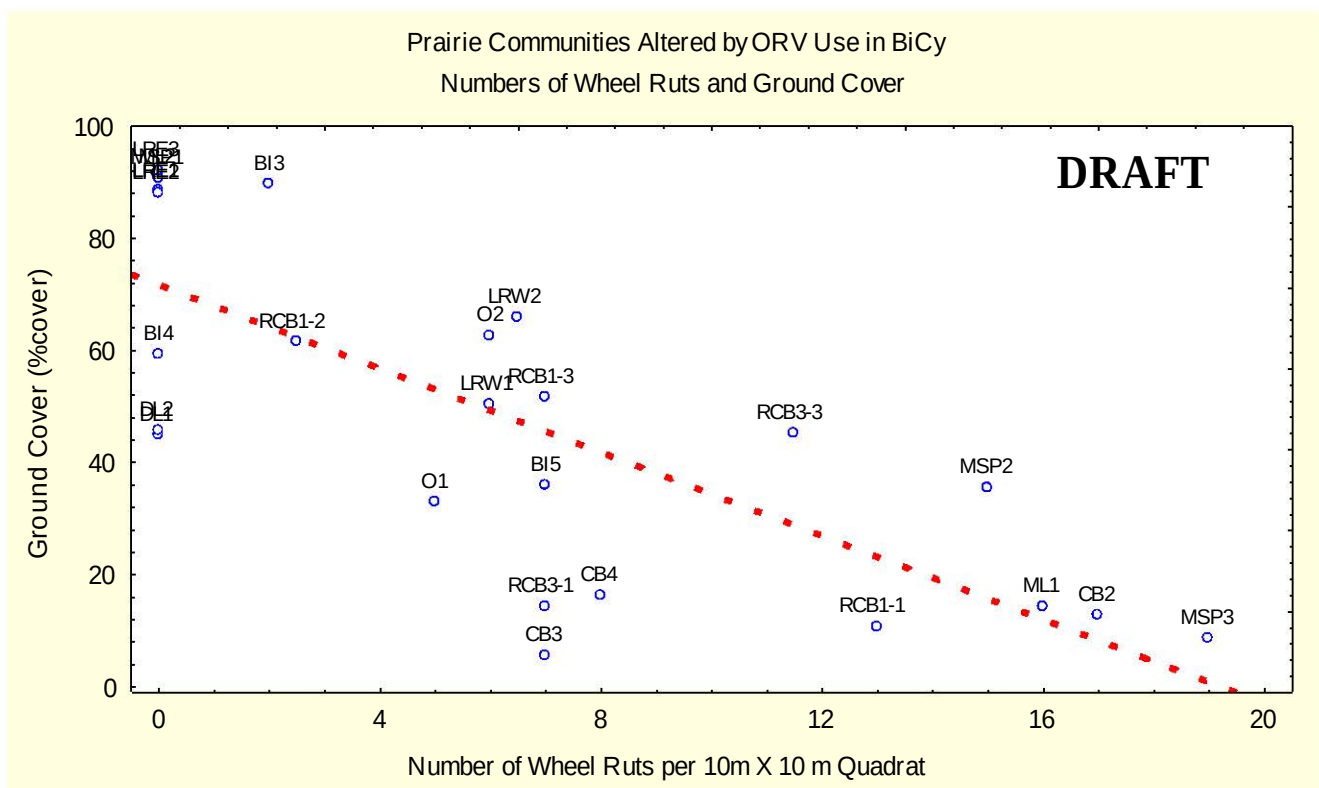


Topographic Variation in Areas Adjacent to Concho Billy Trail. May 2001. Transect 1



Concho Billy Trail, Transect 1, May 2001 (top graph). This graph indicates topography on a transect that extends approximately east to west and perpendicular to Concho Billy Trail, Big Cypress National Preserve. The transect is continuous from the center of the trail, across prairies, to cypress domes on each side of the trail. Elevations were measured every 0.50 m. Areas of prairie adjacent to the trail were heavily rutted by ORV traffic, and a similarly heavily used area adjacent to a cypress dome is evident as variation in elevation.

Topographic Variation in Areas Adjacent to Concho Billy Trail, May 2001 (bottom graph). The bar graph indicates standard deviations (S. D.) of transect (above) segments. S. D. was calculated for each 10 m transect segment as measured from the center of the trail. Elevations were measured every 0.50 m. Greater S. D.s occurred in areas of greater variation from the mean; these are also areas with more habitat alteration and more intense ORV use. Measures of deviation such as this will be used as a measure of habitat disturbance by ORV traffic.



Prairie Communities Altered by ORV Use in BICY, Numbers of Wheel Ruts and Ground Cover (top graph). Less plant growth as ground cover in prairies occurred in quadrats with more wheel ruts in the substrate. Numbers with each data point are indicators for each plot.

Prairie Communities Altered by ORV Use in BICY, Numbers of Wheel Ruts and Ground Cover (bottom graph). Less below-ground plant growth as roots occurred in prairie quadrats with more wheel ruts in the substrate. Numbers with each data point are indicators for each plot.

Proposed Restoration and Monitoring in Other Communities

Mitigation Activities: Estimated Areas

Big Cypress National Preserve proposes to conduct research and restoration activities within the Preserve that will satisfy requirements to mitigate activities associated with stabilizing the approved ORV trail system. The Preserve proposes to undertake restoration and research activities in about 589.91 acres of disturbed native habitat within the Preserve; this area of proposed activity is slightly greater than the calculated mitigation area, and could mitigate an area of trail stabilization calculated to be 148 acres. ORV trail recovery research study areas will occupy about 540 acres of native wetland. Removal of existing fill pads and roads, and subsequent restoration will occur on 49.91 acres of wetland by removing 359,003 yd³ of sand and limestone fill.

ORV Trail Recovery Research

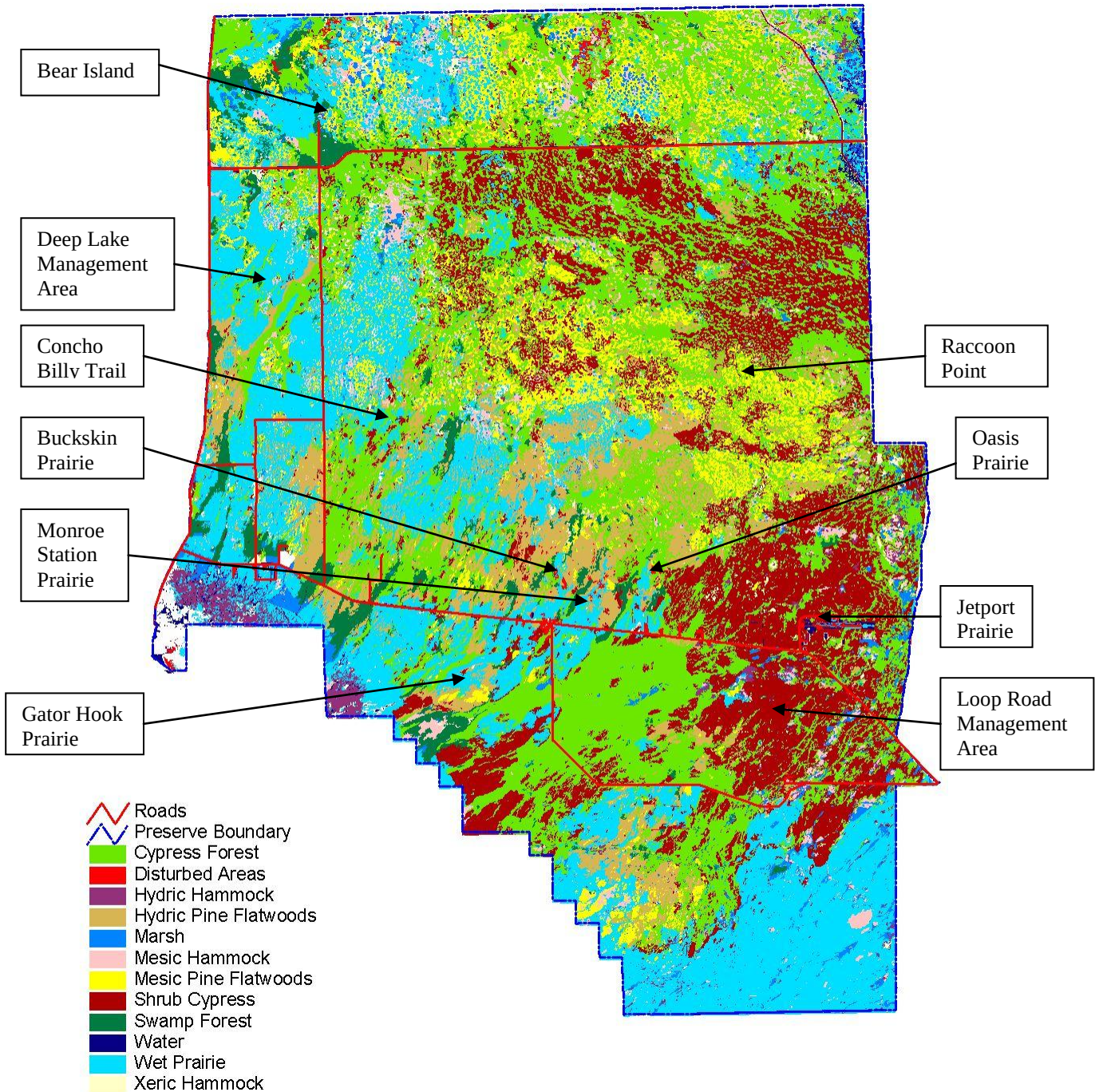
Ecological studies and concomitant monitoring of study areas similar to the ongoing study areas at Concho Billy Trail (above) will be organized to mitigate ground-level trail strengthening activities. These areas will be studied to determine conditions of soils, and their biological communities. Measures of plant communities will be taken during the dry season each year to minimize compromises to the wetland systems by data collection activities, and to maximize the efficiency of data collection. Data will be collected in these areas to measure changes in plant communities over time, so that they can be compared to communities with similar abiotic characters, but with no apparent alteration by off road vehicles. Plant community measures will include densities and diversities of ground cover, shrub canopy, and tree canopy, amounts of wetland-dependent plants, and recruitment of exotic species.

Many wetland prairie communities occur in areas adjacent to trails that are proposed for stabilization, similar to those adjacent to the Concho Billy Trail. These communities are seasonally inundated marl prairies that are dominated by graminoids. Most of these areas have been altered by ORV use for many years, but a few have been closed to ORV use for several years so that succession over several time intervals may be compared. Study areas similar to those established in the Concho Billy trail and restoration site can be established in these other prairie areas.

Areas to be Monitored

Study areas have been identified and preliminary data have been collected at three sites: Concho Billy Trail, Oasis Prairie, and Monroe Station Prairie. In areas that have received trail stabilization. This year two more areas for ecological recovery data collection have been identified: Buckskin Prairie and Gator Hook Prairie. Virtually the entire preserve has been affected by off road vehicle traffic, so that additional ecological survey areas can be quickly identified. Places that are located in areas that will help

facilitate the logistics of data collection include Raccoon Point, Loop Road management area, Deep Lake management area, Jetport Prairie, Bear Island, and other areas.



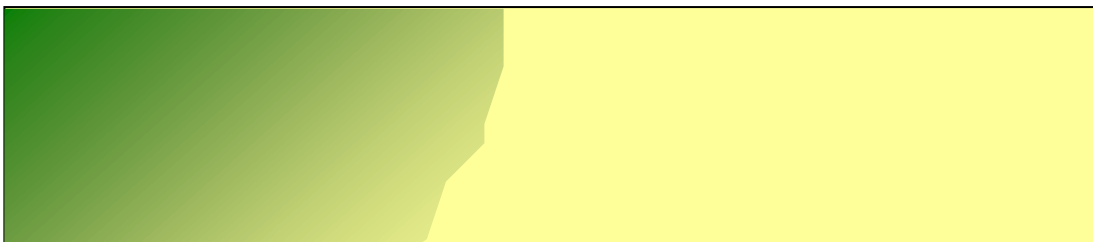
General Vegetation Map of Big Cypress National Preserve. Vegetation mapping was originally completed by the University of Georgia Center for Remote Sensing and Mapping Science in 1999. Vegetative communities were reclassified here based on hydroperiods.

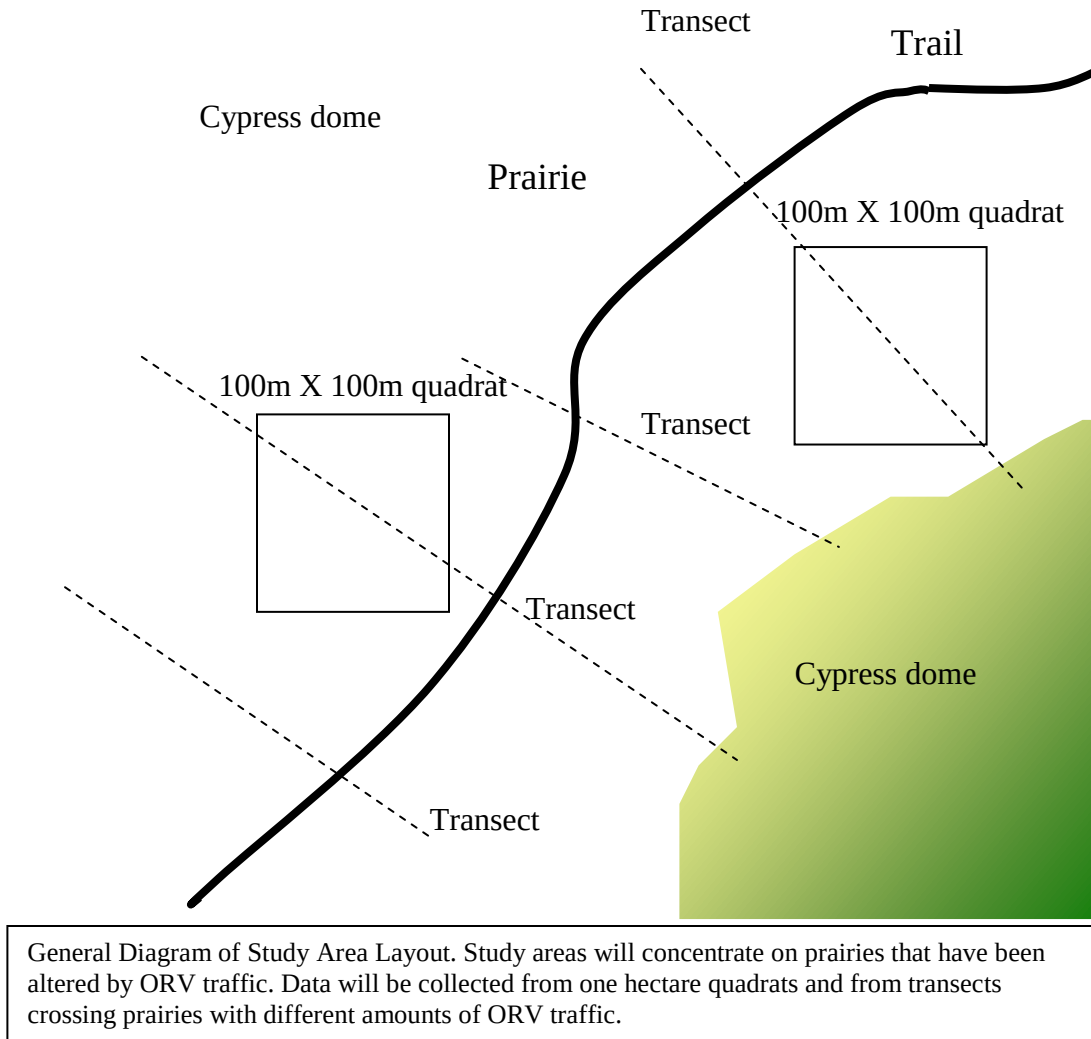
Proposed Studies

At each monitoring location, a combination of quadrat sampling areas and transect sampling areas will be established. Photodocumentation of 100 m X 100 m quadrats will occur annually. Transects will cross the stabilized trail at representative locations and will be located across prairies on which habitat alteration by ORV traffic has occurred. In most places habitat alteration by ORV traffic is most severe closer to the trails and decreases with distance. Density and diversity of ground cover, shrub layer, and tree canopy will be determined at 5 m intervals on these transects. Surface topography, depth to cap rock, soil descriptions, root densities, soil pH, soil organic content, and other relevant environmental variables will be measured. These measures will be compared with measures of disturbance at each site to determine how disturbances may affect the physical and biological characters of the wetland communities.

Habitat Variables to be Measured in Trail Restoration Areas

- Vascular plant diversity
- Vascular plant density (ground cover, shrub canopy, tree canopy, epiphytes)
- Vascular plant root density
- Ground surface micro-topography
- Soil depth to limestone caprock
- Soil organic content
- Soil pH
- Soil carbonate content
- Soil compaction
- Soil constituent size composition
- Exotic species recruitment





Proposed Analyses

Measures of plant communities will be gathered to assess changes associated with succession. Data will be collected in these areas to measure changes in plant communities over time, so that they can be compared with communities having similar abiotic characters, but with no apparent alteration by off road vehicles. Statistical analyses will compare the differences among these communities these communities, and differences between the test areas and areas with no apparent disturbance by off road vehicle use. Multivariate analyses are anticipated to evaluate community changes, and their differences with similar undisturbed communities over time. Changes in amounts of ruderal plants and wetland-dependent plants as a metric of succession will be considered. Recruitment of large numbers of invasive non-native plants will receive two considerations: 1) the exotic plant removal program will consider this as a high priority area for treatment; 2) as a high incidence of exotic recruitment often indicates a

disturbance, restoration activities the area will be evaluated to determine whether restoration activities at that site are effective.

Predicted Outcomes

Comparison of prairie sites that receive surface leveling without soil mixing, with sites that receive no treatment will help determine whether soil leveling treatments may be a worthwhile restoration method in disturbed prairies. Surface leveling will apparently minimize chances that small channels are formed on the substrate that may affect local water movement, but whether this may have an affect on large areas is uncertain. By obtaining detailed information of plant communities we will be able to determine whether significant areas may be affected by small differences in ground surface topography.

Filled Areas for Restoration

Many areas within the Preserve were prepared for construction of residences, businesses, roads, or camps. Almost all of this activity occurred before 1974 when the Preserve was established, or occurred since then on properties within the Preserve that were privately held. In 1997 Big Cypress National Preserve compiled a catalog of disturbed areas within the Preserve (Disturbed Sites Inventory, Big Cypress National Preserve 1997). Areas that may be appropriate for restoration are included with this document.

Typically site preparation consisted of placing fill in wetlands so that construction or other activities could take place; fill was native limestone, sand, or marl that was mined nearby. As part of mitigation activities, the Preserve proposes to restore wetland habitats by eliminating the fill from some of these areas and allowing native wetlands to become re-established in these areas. Fill material consisting of boulders, sand, and other small mineral particles will be returned to borrow areas to create littoral areas on the margins of the borrow ponds that were created by fill-mining activities. Clean gravel that can be extracted from the fill will be stockpiled for use as trail stabilizing material.

Procedure for Fill Site Restoration

1. Mechanically remove fill material;
2. Grade the filled area to the level of mineral soils in the surrounding communities;
3. Replace the organic (surface) layer of soil with clean, native organic soil if available;
4. Materials will be inspected to determine whether environmentally hazardous materials may be part of the fill;
5. Most of the fill material will be placed in borrow pits to create littoral zones on the margins of the ponds created by former mining activities;
6. Restoration areas will be monitored to determine whether native wetland communities are appropriate native wetland succession is occurring.

De-activating Birdon Road Drainage Canal

A canal drains much of the area north of Tamiami Trail near the Birdon Road. This canal empties into the Tamiami Borrow canal about 0.2 mi. west of Birdon Road, and was constructed to the northeast, under Birdon Road and intersecting with the Birdon Road borrow canal, for about a mile into wetland communities. Much of the substrate that was excavated to construct this water delivery structure was piled adjacent to the canal. This now supports a dense shrub community dominated by the exotic Brazilian Pepper (*Schinus terebinthifolius*). Borrow material consisting of boulders, sand, and other small mineral particles will be returned to the canal to block drainage; this fill will be graded and leveled to match the surrounding surface soil grades. Clean gravel that can be extracted from the fill may be stockpiled for use as trail stabilizing material. If sufficient material occurs adjacent to the canal, the entire canal will be filled to surrounding grade. If less than sufficient fill occurs adjacent to the canal to fill the entire canal to surrounding grade, the canal will be plugged with fill at locations that will most effectively help restore the area's hydrology. Appropriate placement of these plugs will be determined by hydrology staff at Big Cypress National Preserve.

Monitoring and Field Sampling Design

Restoration areas will be monitored to determine whether native wetland succession is occurring after fill removal and leveling mineral soils to the levels of mineral soils in the surrounding habitats. Community attributes will be measured to determine whether appropriate succession and native community composition are occurring in the restoration areas.

Vegetative Sampling. Vegetative community compositions in the restoration areas will be estimated for the Baseline (before restoration), Time Zero (At conclusion of physical restoration work), and Year One (one year following physical restoration work) through year five. To monitor changes in the restoration areas, we will establish permanent quadrats to measure plant cover; these measures will occur at least once every six months for at least five years from the time of habitat restoration. Measures of plant cover will be considered as indicators of site conditions, and will be compared with permanent quadrats that will be simultaneously established in the native communities surrounding the restoration areas. The quadrats in the surrounding natural communities will be established within 50 m of the edge of the restoration areas, and will be examined once every six months, simultaneous with the restoration area plant cover measures (above) to estimate cover by vascular plant species. One-meter-by-one-meter PVC quadrats that are divided into 100 dm² units will be placed in the restored community quadrat stations and in the surrounding natural community quadrat stations to estimate cover by all vascular plant and macro-algal species within the shadow of the quadrat.

Photographic Documentation. Permanent photo points will be established at restoration areas.

Fish and Wildlife Observations. Fish and wildlife or signs of wildlife, such as tracks spoor, prey kills, tree rubs, etc. will be noted and recorded during data collection and other times observers are in the restoration areas.

Hydrology. Rainfall, water levels, and basic water quality are recorded at several locations within Big Cypress National Preserve. These data will be made available as appropriate for restoration studies. Measures of water flow beneath several locations at US41 are available from the South Florida Water Management District.

Exotic Species Removal. Almost all of the areas that are elevated with fill are infested with Brazilian pepper (*Schinus terebinthifolius*). These trees will be removed with the fill that allowed monocultural Brazilian pepper stands to develop. The lower ground elevations and restored hydroperiods that will be created in these restored areas will decrease the chances of re-establishment by Brazilian pepper; however, some colonization by this and other exotics can be expected. Big Cypress National Preserve has strong and aggressive program of exotic removal and maintenance that includes ongoing Brazilian pepper containment and removal. We anticipate providing this demonstrated ability to manage exotics by periodic maintenance to keep exotics at a minimum in the restoration areas.

Mitigation Activity Schedule. Proposed calendar periods for mitigation activities.

Restoration Site	Area (ac.)	Restoration	Time zero	Monitoring
Monroe Sta. Prairie	80	2001	Dec '02	Dec '03-'07
Oasis Prairie	100	2001	Jan '03	Jan '04-'08
Jet Port Prairie	60	2001	Feb '03	Feb '04-'08
Gator Hook Prairie	60	2001	Mar '03	Mar '04-'08
Buckskin Prairie	80	2001	Apr '03	Apr '04-'08
Deep Lake Prairie	100	2001	May '03	May '04-'08
Loop Unit	75	2001	Jun '03	Jun '04-'08
Remove Fill Pads	36.71	2002-'07	2003-'08	2004- '12
Plug Birdon Canal	9.7	2004	2004	2004 - 09

Areas of Native Community Mitigation

The Preserve estimates that about 215 miles (312.8 ac.) of designated trail will require stabilization. The chart below outlines proposed research and restoration activities, and their associated areas of activity, that will mitigate trail stabilizing activities. Total estimated area of mitigation activity is 589.91 ac. (see text: ‘Proposed Restoration and Monitoring in Other Communities’).

Mitigation Project	Area Mitigated (Ac.)	Area of Trail Stabilized (Ac.)
Study Areas		
Monroe Station Prairie	80	20.0
Oasis Prairie	100	25.0
Jet Port Prairie	60	15.0
Gator Hook Prairie	60	15.0
Buckskin Prairie	80	20.0
Deep Lake Prairie	100	25.0
Loop Unit	60	15.0
Remove Fill Pads		
Site 27	14.50	
Site 77, 78	1.08	
Site 88	2.51	
Site 89	0.55	
Site 90	0.25	
Site 91	2.28	
Site 92	2.25	
Site 93	0.37	
Site 94	2.80	
Site 95	0.45	
Site 99	1.81	
Site 110	1.83	
Site 111	0.70	
Site 112	1.40	
Site 113	0.80	
Site 114	0.40	
Site 119	2.73	
Bass Lake	3.50	
Birdon canal (1 mi)	9.70	
SiteTotal	49.91	12.48
Total Area	589.91	147.48

