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Fragile Dune Environments:  
Managing for Human Impact

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Human impact on fragile dune environments is a management concern at Indiana Dunes National Lakeshore. As the available space on beaches becomes limited, due to rising water levels on Lake Michigan, visitors to many of the Lakeshore parks are moving into the foredune and backdune areas for socialization, recreational activities, and privacy. After years of such unstructured use, the dunes are showing the effects of human impact. Vegetation that once held shifting sand in place has been trampled and replaced by blowouts and barren footpaths.

### Mitigating Measures

In 1984 the National Park Service made its first assessment of visitor impact on three dune environments: Indiana Dunes National Lakeshore (IDNL), Pictured Rocks National Lakeshore, and Sleeping Bear Dunes, all along Lake Michigan. The purpose of the study was to determine use patterns, activity interests, and visitor knowledge of environmental concerns. After the study was completed, a hierarchy of mitigation measures was identified. The hierarchy, based on levels of control (and not necessarily effectiveness), consisted of:

- \* educational efforts- using interpretive signing to describe the effects of human impact on the environment;
- \* directional signing- indicating areas along roadways and trails where use of the dunes is permissible;
- \* improved trails- providing well-defined pathways, including boardwalks;
- \* exclusion- designating certain areas as "out of bounds" to visitor use through signing and physical barriers;
- \* prohibition- disallowing trespassing of any kind through designated park areas surrounding sites which can be harmed significantly by human impact; and
- \* sanction- issuing warnings and fines to those who trespass through prohibited areas of the park.

The first three measures, representing positive, less authoritative techniques, were formulated into strategies to modify visitor behavior. Results from the 1984 study indicated visitor use of the dunes focused on sunbathing and dune climbing, and that overall knowledge of dune environments was low. These findings led to a proposal for mitigating measures aimed at altering the previously unrestricted use of the dunes. The proposal took into account the consideration that any single element of the hierarchy would not likely provide adequate mitigation without simultaneous use of other measures. This article focuses on changes made at Indiana Dunes National Lakeshore. The following measures were instituted during the summer of 1986:

1. Implementation of an educational program designed to inform visitors about the fragile nature of the dunes and the effects of human impacts;

2. Development of boardwalks through the most heavily used portion of the dunes into a formal trail system with observation and sitting areas provided along the route; and
3. Installation of signs encouraging visitors to use designated trails when moving through heavily used dune areas with "no hiking" signs posted in areas where use was prohibited.

The 1984 study also pointed out that where use was extremely heavy (e.g., next to the bathhouse), educational measures could not be relied upon for modifying visitor behavior. Increased enforcement and/or physical barriers were recommended to stop the spread of sunbathers and climbers into the foredunes surrounding these heavy use zones.

### 1986 Study

To assess the effectiveness of these mitigating measures in controlling visitor impact on the fragile dune environments, a replication study was conducted at IDNL during the summer of 1986 at West Beach, the most heavily used beach along the Lakeshore. In addition to determining visitor use patterns, activity interests, and awareness of environmental concerns, this study focused on visitor knowledge of and reaction to the mitigating techniques employed. Both formal interviews and unobtrusive observations were used during the study, which ran from late May through early September.

## VISITOR RESPONSE TO MITIGATING TECHNIQUES

### Education

Educational techniques primarily emphasized the addition of large, professionally designed interpretive signs placed along the 1/4 mile entrance walkway and on wooden decks adjacent to the bathhouse. Messages focused on description of the dunes and resource protection. Additionally, a small interpretive area was set up inside the bathhouse. The area, staffed by a park interpreter, housed several exhibits describing IDNL and provided literature available for purchase.

Field observations indicated that few people read the interpretive signs, and visitor awareness of resource concerns did not appear to increase. However, visitors indicated that they favored an increase in educational programs. Park interpreters suggested that their role was often aligned more closely with providing directions and information than with interpreting the environment. Considering the water- and activity-oriented nature of West Beach, the apparent lack of attention users gave to interpretive measures is not surprising.

### Formal Trail System

A one-mile boardwalk was constructed to facilitate visitor movement through a fragile portion of the dunes. The boardwalk also provided a means of reaching scenic vistas and served as a self-guided interpretive trail which could enhance educational and informational pursuits in the dune environment.

Reaction to the boardwalk was very favorable. Use by a variety of age groups was evident throughout the summer. The most popular uses included: privacy-seeking young couples escaping the crowded beach environment; older adults observing birds and distant boats through binoculars; and young children using the boardwalk as a play environment.

Throughout the summer season the boardwalk did not appear to be a target for vandalism. However, after Labor Day, when patrolling of beach property decreased, signs of vandalistic behavior appeared, particularly in the form of graffiti and damage to railings along remote sections of the boardwalk.

### Signing

In an attempt to modify the negative use of the dunes, signing and fencing were placed in selective areas in the dune environment. Small "Trail Closed" signs were installed at the head of volunteer footpaths, as was synthetic mesh fencing to impede access to areas designated for protection. On the boardwalk, signs which read "Protect the Dunes" and "Stay on the Boardwalk" were erected. These stacked signs were located in places where users might be tempted to leave the trail.

User response to signing varied. The small signs prohibiting access to footpaths did not appear to deter those who wanted to walk on the dunes. However, the size of the signs may have caused them to be overlooked. Similarly, the boardwalk messages did not stop all visitors from leaving the formal trail system. However, some vegetative revitalization was evident by the end of the summer, indicating that negative impact on the fragile environments was less than in previous years.

### Additional Mitigating Measures Employed

Small gauge wire mesh fencing was attached below the boardwalk and anchored in the sand in an attempt to thwart the movement of visitors from the crowded beach into the foredune areas. However, wind patterns caused the sand below the boardwalk to shift, exposing the bottom of the mesh fencing and subsequently allowing easy access to the foredunes. The principle was sound, but environmental conditions limited the effectiveness of this measure.

A final mitigating measure designated one of the foredunes as a specific Dune Climb Area where climbing and running were permitted. The area was easily accessible, provided excellent vistas, and was broad enough to allow use by several visitors at once. Observation indicated that the area was well used and kept fairly free of debris.

### MANAGEMENT IMPLICATIONS.

The results of the 1986 study suggested several factors were occurring at West Beach which have implications for management. These included:

1. The size of the beach was decreasing due to rising water levels. As a result, visitor movement into the foredunes may increase. It may be possible to control this movement by either designating certain areas as permissible for use or enforcing a no-use policy.
2. Dune use continued to be heaviest around the bathhouse. However, with the addition of the boardwalk, vegetation was beginning to reappear and revitalization may be underway.
3. Visitor knowledge of human impacts and the fragile nature of the dune environment remained low. While most beach users desired an area that is natural in appearance, they were often unaware of the effects that walking on the dunes has on vegetation and encouraging erosion.
4. Most visitors followed boardwalk routes rather than volunteer trails when the boardwalk took them to their destination. Where boardwalks are not financially feasible, marked trails may be effective in funnelling visitor traffic. In the absence of marked trails or boardwalks, visitor tended to wander, which resulted in the widening of existing paths and the creation of new ones.
5. The appearance of more abusive use of the dunes occurred after the summer season ended and the area was no longer closely patrolled. The small percentage of users (5%) that did wander through the dunes during the summer season was enough to maintain the network of volunteer trails that presently exist. Use of volunteer trails would need to be eliminated completely for total revegetation to occur.

These findings may help to formulate recommendations for future action. The management emphasis at Indiana Dunes National Lakeshore continues to focus on lessening visitor impact on the fragile dune environments through both educational and more restrictive actions.

#### RECOMMENDATIONS

After analyzing visitor response to mitigating techniques proposed in the original study, several recommendations appear to be warranted to ensure the continued viability of the dune environment. Recommendations are based on the effectiveness of existing measures coupled with the likelihood of effectiveness of new techniques found successful in similar environments and include:

##### Boardwalk and Trails

Continue maintaining the existing boardwalk with the possibility of extending it to the paved parking lot. Currently, the southernmost segment of the boardwalk ends in a detection of the backdunes. Boardwalk users must then choose their own route to the parking lot nearby. As a result, several footpaths exist when one could serve the purpose. If the boardwalk were extended to the parking lot, a hard-surfaced trail loop would be possible (a section of which would include the entrance walkway from the parking lot to the bathhouse).

## Signing

Reword the boardwalk signing to provide a more personalized and meaningful message. Alternatives include:

DUNES ARE FRAGILE AREAS  
PROTECT YOUR DUNES  
PLEASE STAY ON THE BOARDWALK

or

DUNES ARE FRAGILE AREAS  
PROTECT YOUR DUNES  
USE THE DUNE CLIMB AREA IN  
FRONT OF THE BATHHOUSE

These messages would stress the visitor's connection with the natural resource area as well as indicate where visitors are allowed to climb on the dunes. Similar signing should be located along the entrance route to the park and in the parking lots so visitors are informed about the fragile environment before entering it.

## Alternate Activity Options

To alleviate negative dune use which may occur out of boredom, recreational amenities for group use should be provided on the beach. For example, portable volleyball standards with nets could be placed at the far ends of the beach zone. Such areas would provide activity alternatives and should also help reduce congestion in the more heavily used central beach areas.

## Controlling Dune Use

Visitor use in the dunes may also be regulated by providing both media coverage and on-site information about responsible use of the resources. Since a majority of the visitors live within a one hour drive of the park, the need for environmental protection can be emphasized by placing articles and public service announcements in local and regional news media.

While human impact is altering, and in some instances destroying fragile dune environments at IDNL, management is taking steps to ensure environmental integrity for the future. The dune environment, which has been unstructured in regard to defining areas for visitor movement throughout the dunes, has begun to show negative effects. The results of the two studies focusing on visitor knowledge and use patterns indicated that visitors to the park desire a natural looking environment yet have little knowledge of the effects that human impact has on the dunes. This is critical in that many visitors plan on including a trip through the dunes as part of their visit to the park.

Mitigating techniques recommended in the original study provided mixed reactions from visitors. Observations affirmed that visitors could be channeled through specific routes via boardwalks and designated signed trails. As a result, vegetation revitalization became evident. Additionally, a designated

Dune Climb area was recognized as a means of providing visitors with an acceptable area to climb on the dunes. The designated area may have the potential of reducing impact on more fragile environments elsewhere in the park.

From a management perspective, the use of boardwalks, interpretive educational signing, fencing to channel and exclude visitors, and informational signing along trails and pathways were considered acceptable alternatives for modifying the effects of human impact on the dunes. Visitor response and behavior patterns supported the boardwalk and to a lesser extent, the channeling effects of plastic mesh fencing. From the viewpoint of matching management and visitor perspectives, the most favorable approach to controlling human impact on the dunes appears to include the following recommendations: continue maintaining and extend the boardwalk; maintain mesh fencing used to channel visitors through those areas where there is no boardwalk; modify the signing along the boardwalk to include a more personalized approach to keeping visitors off the dunes, and retain the existing level of interpretive educational signing. In a environment which is primarily recreation activity-oriented, the most effective mitigating measures will probably be those that act upon modifying visitor behavior through physical changes in the environment rather than through educational messages. However, efforts to educate visitors before they reach the park may also prove effective.

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