Nekoosa, Wisconsin, USA

Sand Valley: Bringing Nature Back with Conservation Golf

Michael Keiser[1], Henry Lesnik[1], Iza Redlinski[2], Douglas Stotz[2], Abigail Derby Lewis[2], Debra Moskovits[2] Laurel Ross[2] & Jens Jensen[3]

[1]Sand Valley Golf Resort, [2]Field Museum, & [3]Jensen Ecology

Photos: Iza Redlinski, Jens Jensen, J&J Balaban, Henry Lesnik, Kathryn Corio, Will Taylor, Ryan Brady, Edward A. Hedborn Jr., Brittany Steff, Chris Wellner, John Hilty, and Peter Paplanus. Produced and Designed by: Alicia Diaz [adiaz@fieldmuseum.org]. Acknowledgment: Mark Johnston.

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"That land is a community is the basic concept of ecology, but that land is to be loved and respected is an extension of ethics. That land yields a cultural harvest is a fact long known, but latterly often forgotten."
— Aldo Leopold, *A Sand County Almanac*

Sand Valley: History, Restoration, and Beyond

Wisconsin's Central Sands were originally formed by massive glaciers. 19,000 years ago, the Wisconsin Glacier dammed an ancient river channel (where today's Wisconsin River flows) forming Glacial Lake Wisconsin—70 miles wide/160 feet deep. The gargantuan lake drained 5,000 years later when warmer climates melted the ice. But the sand remained. And unique communities—like our sand barrens, sand prairies, black oak and jack pine savannas—evolved to thrive in this harsh environment. These habitats harbor extraordinary, rare plants and animals.

Eventually, these specialized habitats were ravaged for pine plantations. When our work began in 2014, Sand Valley was rows upon rows of red pines with remnant patches of open sand prairie, black oaks, and jack pines scattered throughout. These precious remnants are crucial to our restoration efforts today. Additional re-seeding expands diversity and speeds up restoration. After clearing plantation trees, re-seeding is the first healing treatment. We then continuously control for invasive species and return cleansing fire to the system.

Sand Valley is rebounding. The remnant plant communities, robust native seed bank, and deep commitment to restoration, all give us hope that a rich ecosystem will flourish. To learn more about Sand Valley Golf Resort, visit https://sandvalley.com/

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Sand Prairie at Sand Valley

"During every week from April to September, there are on average ten wild plants coming into first bloom." — Aldo Leopold, *A Sand County Almanac*

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Sand Prairie at Sand Valley

Sand Prairie Habitat

Sand prairies once covered large swaths of Wisconsin's Central Sands. Only a small portion remains with ecological integrity, with an even tinier fraction in high-quality condition. Sand prairies have less than 10% tree cover, but ample grass or sedge ground cover. Many natural disturbances—mainly landscape wildfires, but also wind blowouts, and flooding rivers and streams—played a key role in the evolution of this habitat. Among the dense mats of grasses and grass-like plants grow many forbs—plants with showy flowers—including sand specialists, such as the Large-flowered Beardtongue. The grasses and sedges are about 1 to 2 feet tall. While large mammals are still mostly missing, sand prairies are home to smaller mammals such as Franklin's ground squirrel, uncommon birds such as Upland Sandpiper and Grasshopper Sparrow, and rare reptiles such as the slender glass lizard. The many rare plants host specialized insects that evolved with those plants, such as the endangered Persius Duskywing butterfly.

Sand Prairie Prescribed Fires

Monarch Butterfly
Danaus plexippus

Karner Blue Butterfly
Lycaeides melissa samuelis

Restoration at Sand Valley, 250 acres

Despite almost complete destruction by timber production, native plant communities persisted among rows of Red Pines because the plantation was not treated severely with herbicides, unlike traditional intensive farming. Removal of pines as the first step of restoration opened opportunities for these native plants. But highly aggressive invasive plants like Mullein, Spotted Knapweed, Sweet Clovers, and shrubs such as Honeysuckle, also moved in. We tackled these problems by spreading seeds from native grasses and wildflowers to hold the land before invasives could dominate. Then, the sand prairies began to return.

The Central Sands evolved in a landscape stewarded by indigenous communities who used fire as a part of their sustainable management. Natural fires resulting from lightning strikes also contributed. In a similar effort to help nature thrive in the area, we work with local firefighters and ecologists to apply regular prescribed fires to our sand prairies.

Monarch Butterfly

Despite numbering in the tens of millions, the Monarch butterfly has declined more than 80% recently. Monarchs lay their eggs on milkweeds. The developing caterpillars feed only on milkweed, sequestering the milkweeds' foul-tasting, toxic chemicals as protection against predators. Caterpillars use at least 27 species of milkweed. Three of these commonly grow in Sand Valley: Butterflyweed with showy orange flowers, Whorled Milkweed with small white flowers, and Common Milkweed with fragrant pink flowers.

Monarchs have a complex life cycle with four generations annually. The population east of the Rocky Mountains winters in fir forests in central Mexico and Michoacán, where they cover trees in dense clusters. Overwintering Monarchs begin their northward migration in March, breeding in late March and April in the southern US. These adults fly to the northern US and Canada, arriving in late May and June. They live 4 to 6 weeks, produce a new generation, and then two more. The last generation emerges mid-August, becoming the migratory population that travels south (September to November). The cycle begins again the following March.

Karner Blue Butterfly

The endangered Karner Blue occurs from Minnesota to New Hampshire on sandy soils that support wild lupines. Adults feed on various flowers; caterpillars feed on lupine alone. Once widespread in their range, Karner Blues have declined by 99% because of habitat loss and fragmentation. Adding to this stress, climate change has altered timing of lupine leafout, creating a mismatch in timing between lupine availability and hungry caterpillars in early spring. Necedah National Wildlife Refuge (18 miles west of Sand Valley) has the largest Wisconsin populations of Karner Blues. Sand Valley's population is growing as the high-quality habitat is restored.

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BLOOM TIME:
Indicated by Months

SUN EXPOSURE PREFERENCE:
Full Sun **Part Sun** **Shade**

SOIL MOISTURE PREFERENCE:
Dry **Dry to Medium** **Medium** **Moist** **Wet**

Selected Seasonal Plants and Animals in a Sand Prairie Habitat

Spring

1 Hoary Puccoon
Lithospermum canescens
BORAGINACEAE

Apr-Jul

2 Large-flowered Beardtongue
Penstemon grandiflorus
PLANTAGINACEAE

May-Jun

Summer

3 Goat's Rue
Tephrosia virginiana
FABACEAE

Jun-Jul

4 Hoary Vervain
Verbena stricta
VERBENACEAE

Jun-Sep

Fall

5 Big Bluestem
Andropogon gerardii
POACEAE

Jun-Sep

6 Rough Blazing Star
Liatris aspera
ASTERACEAE

Jul-Nov

Winter

7 Pennsylvania Sedge
Carex pensylvanica
CYPERACEAE

Apr-May

8 Plains Pocket Gopher Mounds
Geomys bursurus
GEOMYIDAE

Animal Sighting

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Oak Savanna/Jack Pines Habitat at Sand Valley

"To plant a pine…one need be neither god nor poet; one need only own a good shovel."
— Aldo Leopold, *A Sand County Almanac*

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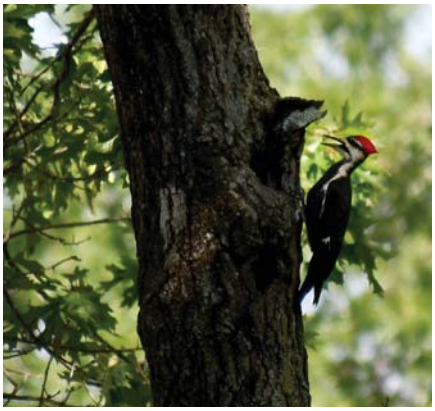
Oak Savanna/Jack Pines Habitat at Sand Valley

Oak Savanna/Jack Pines Prescribed Fires

Kirtland's Warbler
Setophaga kirtlandii



Pileated Woodpecker
Dryocopus pileatus

Oak Savanna/Jack Pines Habitat

Pine-Oak Savanna or Barrens is a plant community characterized by scattered woody vegetation with a graminoid (grassy) understory. In Wisconsin, these communities are ranked "imperiled" which means, at risk of being harmed. This unique plant community evolved on sandy soil strongly influenced by fire. Prescribed fire is one of the most crucial tools used to maintain the health of this diverse habitat. Savannas have a well-developed shrub component, including American Hazelnut, New Jersey Tea, Lead-plant, and Sweetfern.

Records suggest that the understory vegetation was more diverse in the past with many more species of grasses and sedges. The suppression of fire and the introduction of grazing and monoculture plantations have not only favored invasive species, which become an increasing threat, but also reduced some native species. This presents management challenges that we are working to address.

Restoration at Sand Valley, 200 acres

The Pine-Oak savannas in Sand Valley occur on the steeper slopes, where indigenous pines and oaks persisted because of the difficulty of establishing a pine plantation on slopes. Our savannas are precious native remnants. These habitats provide a window into what much of the landscape looked like before the monoculture plantations took over and helps us set goals for restoration.

Prescribed fires allows Jack Pines to reproduce—resin seals their pine cones, which only release seeds under extreme heat. Oaks also have thick bark and can re-sprout after fires because of large root systems. Animals that inhabit the savannas benefit greatly from the fires, which bring essential open habitat and subsequently food for grassland birds like Sharp-tailed Grouse.

Kirtland's Warbler

The rare Kirtland's Warbler tells a beautiful conservation story. This handsome warbler needs young Jack pine stands, like those in the Sand Valley restoration, for adults to nest and raise their young. Every spring, the birds return from wintering in the Bahamas to search for this specialized habitat, which has been replaced almost entirely with pine plantations. Through restoration, Kirtland's have recovered—from 167 pairs in 1974 to 2,300 breeding pairs in 2019. They are no longer in the Endangered Species List. Sand Valley remains the stronghold for this warbler in Wisconsin. In 2019, 16 Wisconsin nests produced 55 fledglings!

Pileated Woodpecker

The charismatic Pileated Woodpecker, second in size among North American woodpeckers only to the extinct Ivory-billed, sports a striking red crest. Pileated Woodpeckers have increased in numbers because tree cover, happily, expanded in the 20th century. Present year-round, their raucous calls ring through large tree stands. They feed on carpenter ants, termites, and larvae of wood-boring beetles in large dead trees. In the fall, they feed on fruit. Characteristic square holes of Pileated nest cavities alert observers to their presence. Around Sand Valley, they occupy the dense stands of older trees.

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BLOOM TIME:
Indicated by Months

SUN EXPOSURE PREFERENCE:
Full Sun **Part Sun** **Shade**

SOIL MOISTURE PREFERENCE:
Dry **Dry to Medium** **Medium** **Moist** **Wet**

Selected Seasonal Plants and Animals in a Jack Pine/Savanna Oak Habitat

Spring

9 Sand Coreopsis (lance-leaved)
Coreopsis lanceolata
ASTERACEAE

May-Aug

10 Bird's Foot Violet
Viola pedata
VIOLACEAE

Apr-Aug

Summer

11 Black-eyed Susan
Rudbeckia sp.
ASTERACEAE

Mar-Sep

12 Spotted Bee-balm
Monarda punctata
LAMIACEAE

Jul-Oct

Fall

13 Gray Wolf
Canis lupus
CANIDAE

Animal Sighting

14 Staghorn Sumac
Rhus typhinus
ANACARDIACEAE

Jun-Jul

Winter

15 Ruffed Grouse
Bonasa umbellus
PHASIANIDAE

Animal Sighting

16 Black Oak
Quercus velutina
FAGACEAE

Mar-Jul

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Sand Barrens/Dunes Habitat at Sand Valley

"On this sand farm in Wisconsin…we try to rebuild…what we are losing elsewhere."
— Aldo Leopold, *A Sand County Almanac*

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Sand Barrens/Dunes Habitat at Sand Valley

Slender Glass Lizard
Ophisaurus attenuatus

Eastern Prickly Pear Cactus
Opuntia humifusa

Sand Barrens/Dunes Habitat
Sand prairies feature exposed areas that gophers, badgers, and other wildlife use to create mounds or dig shelters. Once there is an opening, wind and other elements increase their footprint by blowing soils around. Plants and animals adapted to disturbance move into these areas. Some of these pioneering species, like Sand False Heather and Prairie Fame flower are very rare, and occur primarily in the dunes and sand barrens. The large-scale blowouts also harbor delicate crusts of mosses, lichens and even cyanobacteria, a rare occurrence in the Midwest that needs more study. But invasive species like Spotted Knapweed also quickly colonize these open areas, and management must be constantly vigilant. The sand blowouts correspond to some of the aesthetic goals of the golf course and feature in the design of the Sand Valley restoration landscape.

Restoration at Sand Valley, 30 acres
Sand barrens and blowouts, similar to savannas, appear on steeper slopes where pine plantations could not be established easily. They account for 30 acres of Sand Valley property.

Slender Glass Lizard
The Slender Glass Lizard population, likely once abundant in the open prairies and sand barrens of Wisconsin, has been severely reduced due to habitat loss. This legless lizard, which can detach its tail as a survival mechanism if attacked by a predator, moves gracefully through environments in a snake-like fashion by pushing its body laterally against vegetation. The ecology of this federally endangered species is not well understood since they spend the majority of their time underground, only coming to the surface on cool sunny days in late May and again in late July to early September.

Eastern Prickly Pear Cactus
Prickly pear cactus – a true cactus with prickles that can defiantly cut through skin – is often a delightful surprise for many in the Midwest. The plant prefers medium to dry sandy or rocky soils, and sometimes can sprawl over large areas and form mats. A beautiful, large yellow flower opens up through early summer and attracts a variety of bees (including rare sand dwelling bees) and beetles for both nectar and pollen.

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SOIL MOISTURE PREFERENCE:
Dry **Dry to Medium** **Medium** **Moist** **Wet**

Selected Seasonal Plants, Animals, and Fungus in a Sand Barrens/Dunes Habitat

Spring

17 Sand False Heather
Hudsonia tomentosa
CISTACEAE

May-Aug

18 Earthstar Fungus
Astraeus sp.
DIPLOCYSTACEAE

May-Jun

Summer

19 June Grass
Koeleria macrantha
POACEAE

May-Jul

20 Prairie Fame Flower
Phemeranthus rugospermus
MONTIACEAE

Jun-Sep

Fall

21 Scribner's Switch Grass
Dichanthelium scribnerianum
POACEAE

May-Jul

22 Clasping Milkweed
Asclepias amplexicaulis
APOCYNACEAE

May-Jul

Winter

23 Common Raven
Corvus corax
CORVIDAE

Animal Sighting

24 Hill's Oak
Quercus ellipsoidalis
FAGACEAE

Apr-Jun

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Tamarack Swamp Habitat at Sand Valley

"Like winds and sunsets, wild things were taken for granted until progress began to do away with them. Now we face the question whether a still higher 'standard of living' is worth its cost in things natural, wild and free." — Aldo Leopold, *A Sand County Almanac*

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Tamarack Swamp Habitat at Sand Valley

Tamarack Swamp Habitat

Indian Pipe/Ghost Plant
Monotropa uniflora

Northern Amber Bumble Bee
Bombus borealis

Tamarack Swamp Habitat
Tamarack swamp is an unfamiliar ecosystem, dominated by stands of the only deciduous conifer in Wisconsin—the Tamarack. This type of swamp needs particular conditions to survive: the trees require almost-constant presence of water and ample sunlight for their seeds to germinate and thrive as seedlings. Natural disturbances, such as fire and floods that decrease competition from other trees, are essential.

Other unusual plants grow in this specialized habitat, including Sphagnum and Feather Mosses. The ground layer harbors mostly grasses and sedges. The vegetation creates many microhabitats, which in turn host a variety of invertebrates such as the Dion Skipper (*Euphyes dion*) and the Mulberry Wing (*Poanes massasoit*). Canada Warblers, Black-throated Green Warblers, and Nashville Warblers breed in these swamps.

In Wisconsin's Central Sands, tamarack swamps have an uncertain future because of their specific hydrological requirements and need for fire and flood. Active management, such as restoring hydrology and returning prescribed burns to the landscape, counteract these stresses and promote a healthy ecosystem.

Restoration at Sand Valley, 40 acres
These conifer swamps remained largely untouched because the land was not suitable for growing pines, but the habitat is perfect for a wide array of fungi and rare plants. Quaking Aspens also thrive in this community because of the plentiful organic matter in the soil.

Indian Pipe/Ghost Plant
Indian Pipes are remarkable plants that lack chlorophyll and do not get their nutrients through photosynthesis, as most plants do. This means that they can grow in almost complete darkness, where their ghostly white appearance inspired their common name Ghost Plant. Indian Pipes are parasitic, sustained by a complicated system that syphons nutrients from fungi, trees, and decaying plant matter.

Northern Amber Bumble Bee
The Northern Amber Bumble Bee, one of several uncommon bumble bee species, occurs throughout the Midwest and Canada. Northern Amber Bumble Bees have long tongues for reaching nectar, allowing them to use a wide array of flowers. Like many bumble bees, this species nests underground in colonies of between 50 to 200 individuals. The queen is the only one to survive the winter. Upon emerging from hibernation, she builds a nest, lays a batch of eggs, and tends them until the workers hatch and take over tending the hive. She continues producing eggs until mid-to-late summer, when she lays specialized eggs that hatch as males and future queens. This generation mates and the queens go into hibernation, repeating the cycle. Bumble bees and other pollinators face many threats, particularly habitat loss, pesticide use, and competition with invasive species.

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Indicated by Months

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Full Sun **Part Sun** **Shade**

SOIL MOISTURE PREFERENCE:
Dry **Dry to Medium** **Medium** **Moist** **Wet**

Selected Seasonal Plants and Animals in a Tamarack Swamp Habitat

Spring

25 Tamarack
Larix laricina
PINACEAE

Apr-May

26 Common Hair Moss
Polytrichum commune
POLYTRICHACEAE

Summer

27 Whorled Loosestrife
Lysimachia quadrifolia
PRIMULACEAE

Jun-Sep

28 Eastern Hardhack
Spiraea tomentosa
ROSACEAE

Jul-Sep

Fall

29 Quaking Aspen
Populus tremuloides
SALICACEAE

Mar-May

30 Red-spotted Purple Butterfly
Limenitis arthemis
NYMPHALIDAE

Animal Sighting

Winter

31 Red Bullrush
Scirpus pendulus
CYPERACEAE

May-Jun

32 Sweetfern
Comptonia peregrina
MYRICACEAE

Apr

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Sand Valley Habitats & Trails

Habitats and Wildlife

Sand Prairie Habitat
Sighting: Karner Blue Butterfly & Monarch Butterfly

Oak Savanna/Jack Pines Habitat
Sighting: Kirtland's Warbler & Pileated Woodpecker

Sand Barrens/Dunes Habitat
Sighting: Slender Glass Lizard & Eastern Prickly Pear Cactus

Tamarack Swamp Habitat
Sighting: Indian Pipe/Ghost Plant & Northern Amber Bumble Bee

Trails

- Trailhead
- **Bentley Hills Trail** (2.3 MIles)
- **Junegrass Connection** (1.6 Miles)
- **Karner Connection Trail** (2.3 Miles)
- **Ridge Trail** (2.5 Miles)
- **Songbird Trail** (1.2 Miles)

General Information

- Resort Entrance
- P Parking
- 1 Clubhouse
- 2 Craig's Porch
- 3 Lake Arrowhead Chalet
- 4 Tennis Courts

Adapted from: 1. Sand Valley Habitat Areas by Jensen Ecology, by JRJ, 9/13/21. 2. Sand Valley Hiking Map, Welcome to Rome, https://www.visitromewi.com/hiking-biking

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