

- ↪ **What is sand?**
- ↪ Where does it come from?
- ↪ Waves and wave energy
- ↪ How global climate change will influence waves and wave transport
- ↪ Dune types and formation
- ↪ **Natural dune communities**
- ↪ Introduced beachgrass and influence on beach and dunes
- ↪ Surf zone and sand dwelling organisms and food web
- ↪ Snowy plover biology
- ↪ Oregon beach law
- ↪ Field trip

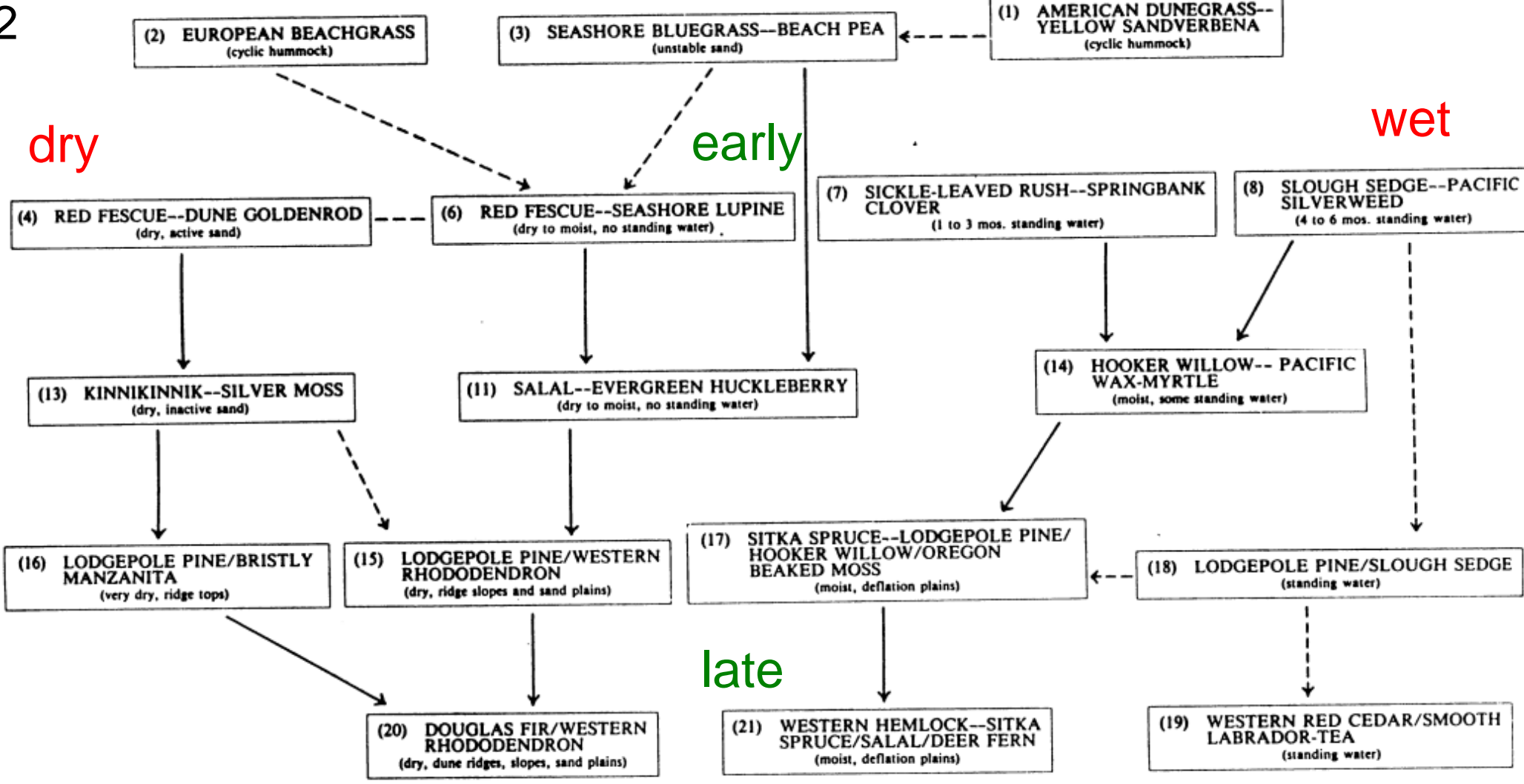
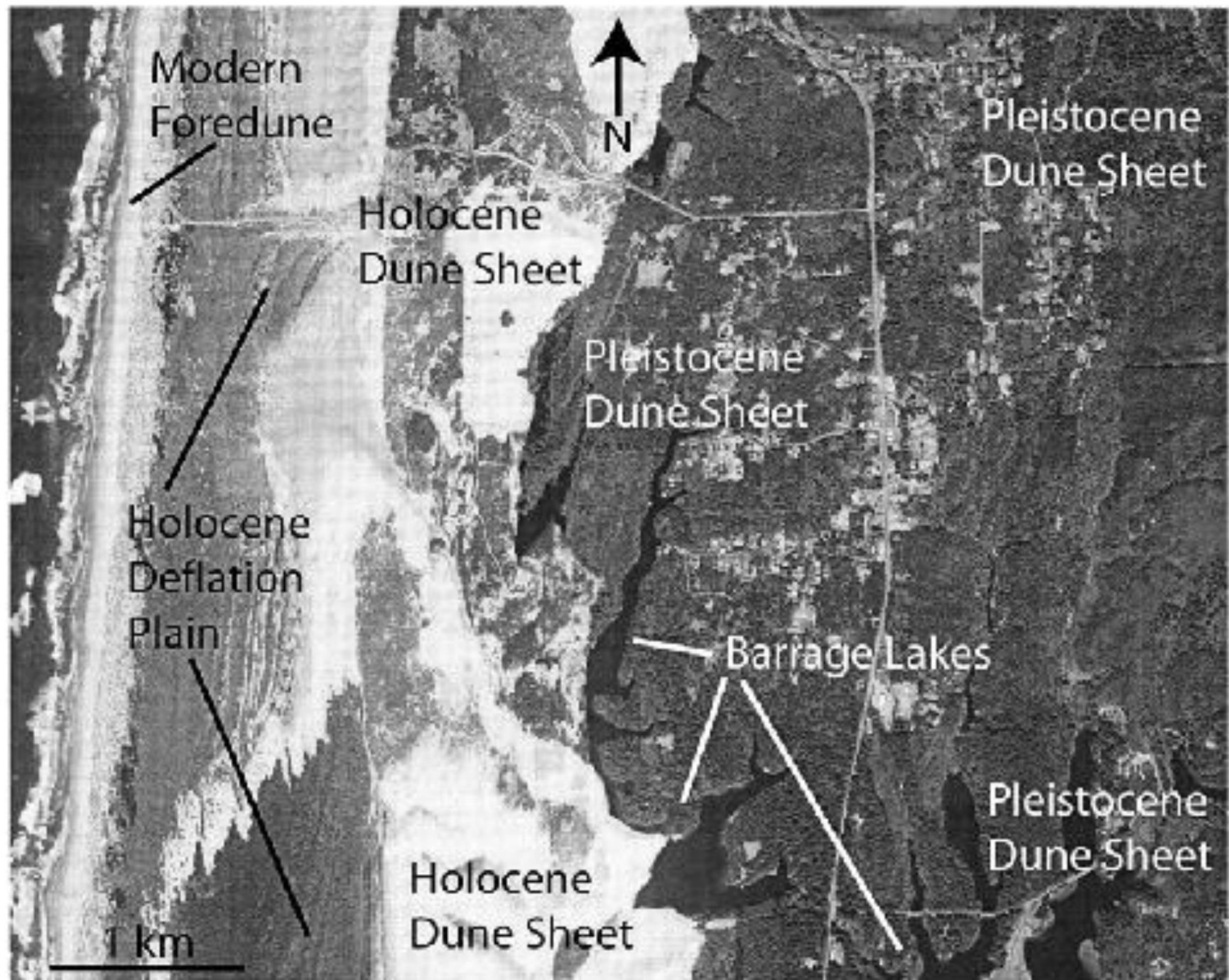


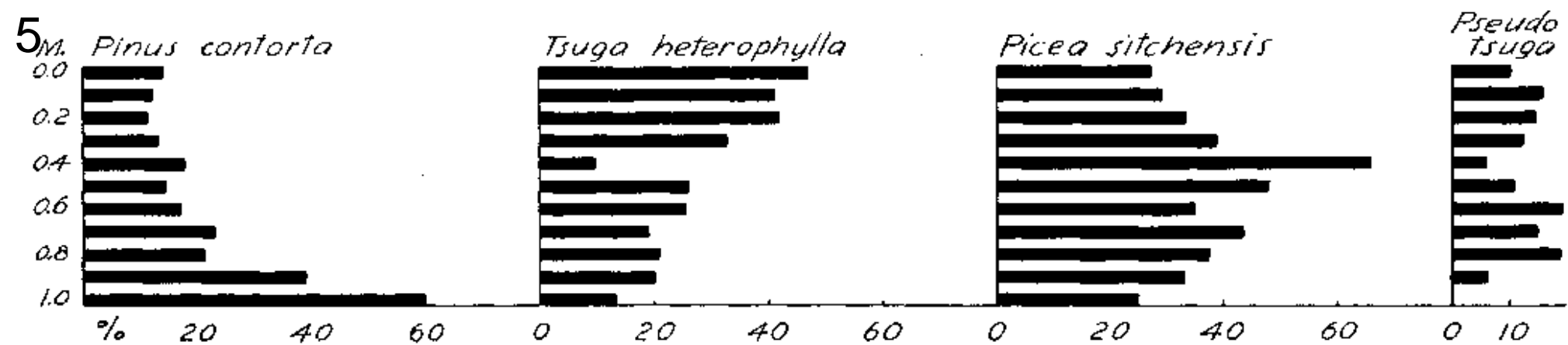
Figure 39. General successional relationships of sand dune plant communities of the Pacific Northwest coastal dunes. Plant communities resulting from stabilization plantings are not included, nor are plant communities found only on the sand dunes south of Bandon, Oregon. The number in parentheses before each plant community refers to the number of that community in Table 8. The solid line (—) shows the most common and obvious successional pathways. The dashed line (-----) shows the less common or possible pathways.

Wiedemann, 1984

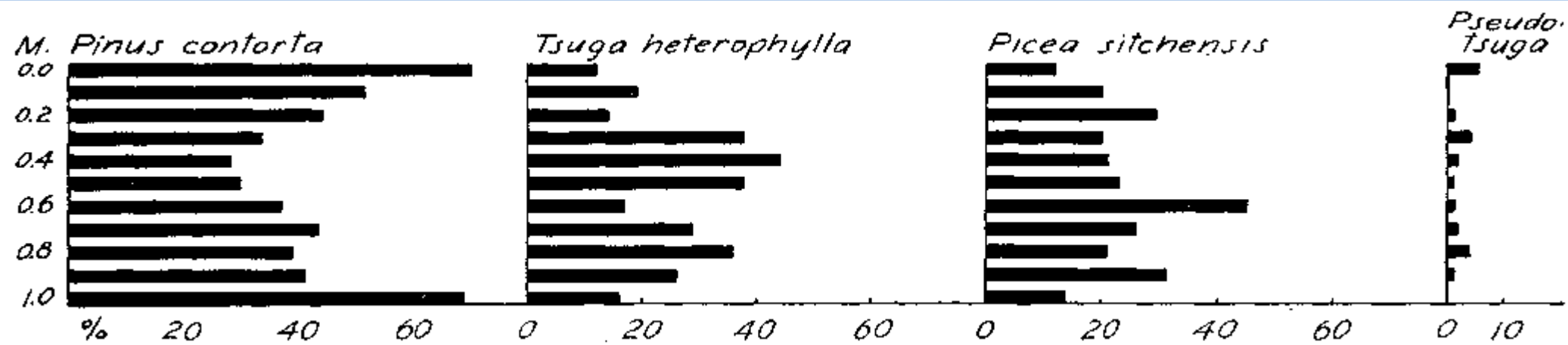
Natural dune communities







Hauser (Hansen, 1944)



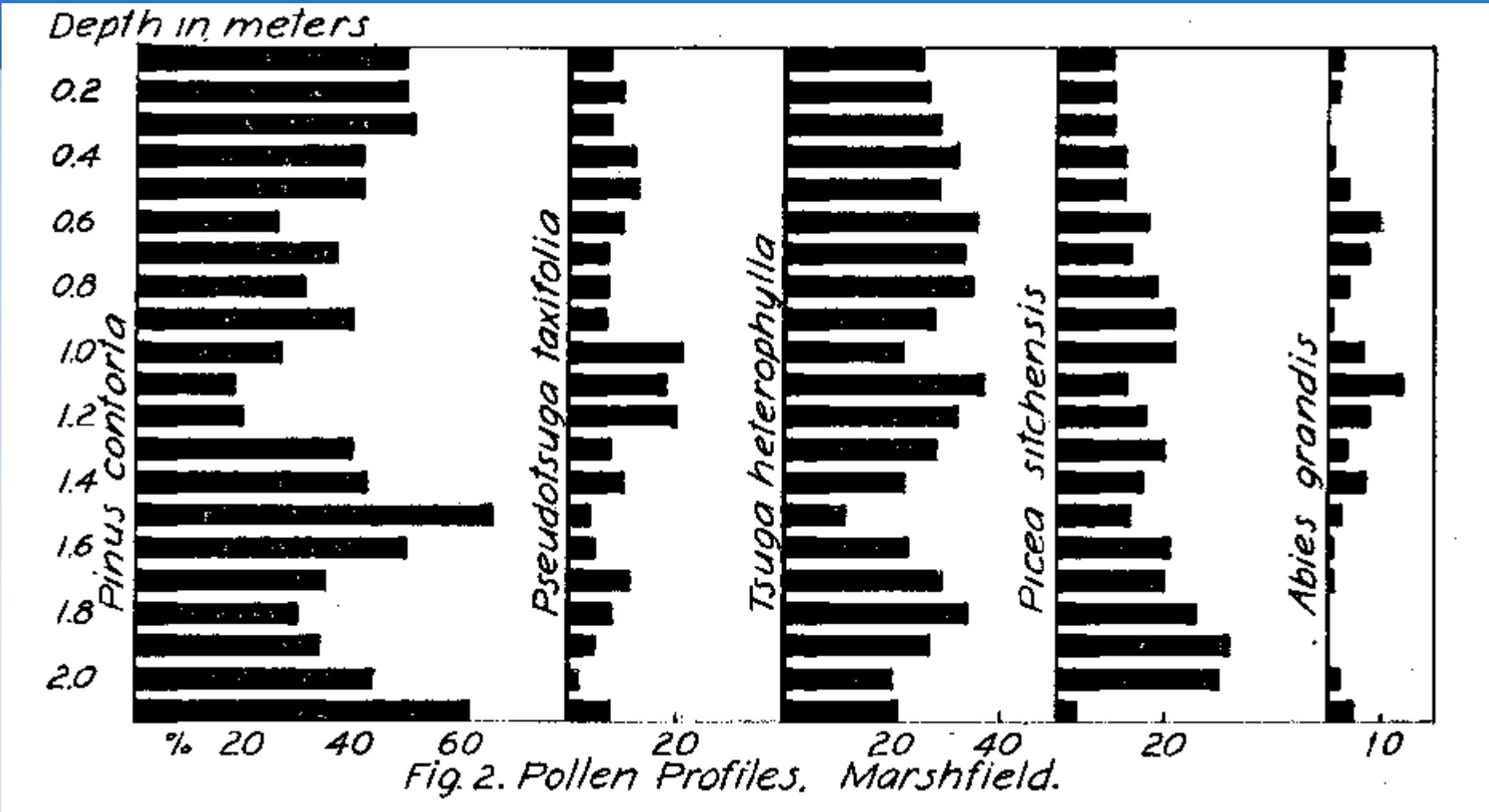
Newport (Hansen, 1944)

Pinus contorta = Lodgepole Pine

Tsuga heterophylla = Western Hemlock

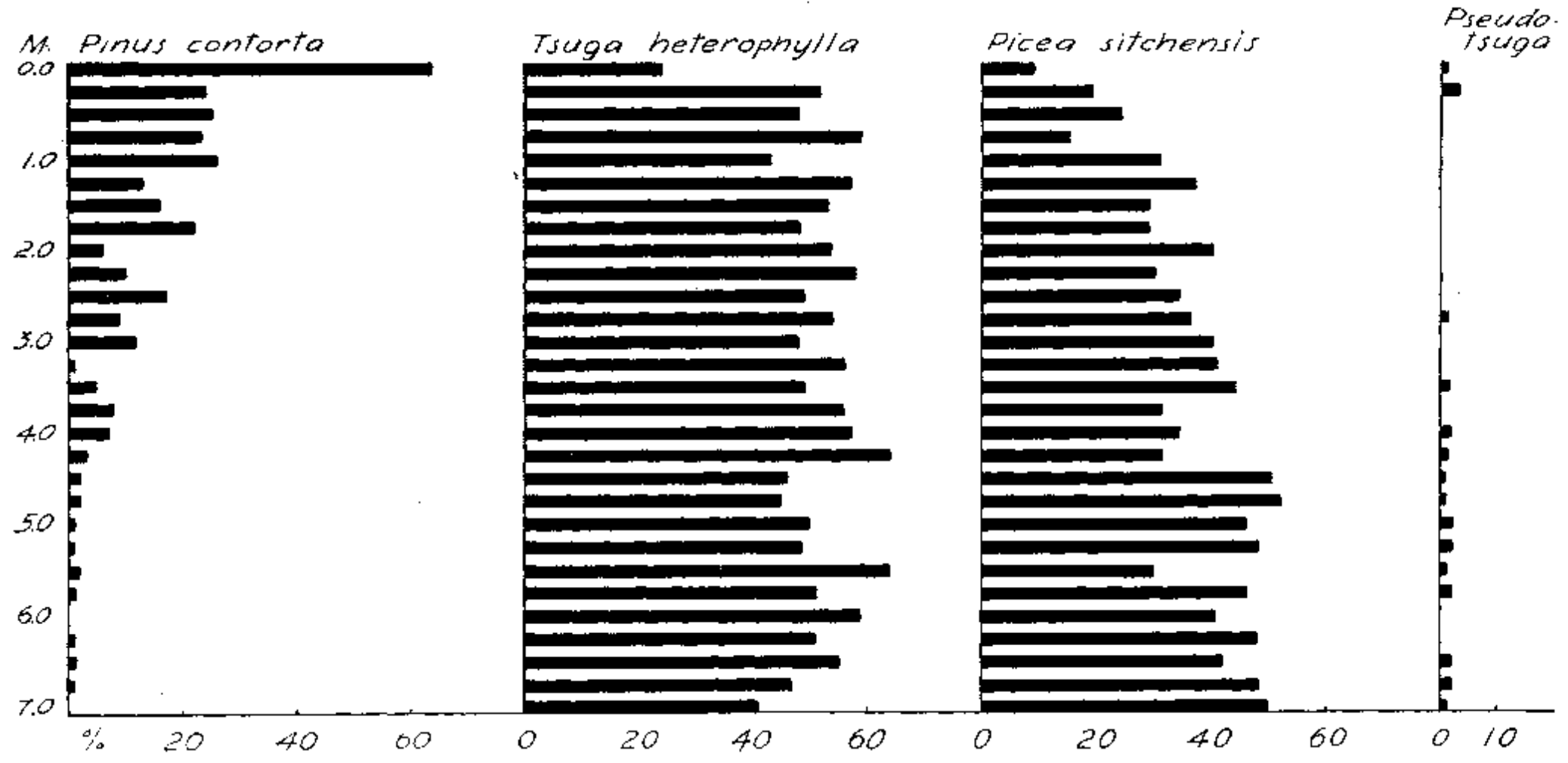
Picea sitchensis = Sitka Spruce

Pseudotsuga toxifolio = Douglas Fir



Hansen, 1943

Abies grandis = Grand Fir, Oregon Fir



Gearhart (Hansen 1944)

TABLE 3. Relative importance values of dominant species in the

| Species | Pioneer | | | Herbs | | Shrub | | c |
|--|---------|----|----------------|-------|-----|----------------|---|---|
| | I | | | II | III | IV Segments | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| <i>Contobulus soldanella</i> L. | | 7 | | | | | | |
| <i>Abronia latifolia</i> Esch. | 1 | 1 | | 1 | | | | |
| <i>Franeria chamissonis</i> Less | 1 | 1 | T ^a | 1 | | | | |
| <i>Carex macrocephala</i> Willd | 17 | 11 | 12 | | | | | |
| <i>Glehnia leiocarpa</i> Math. | 20 | 19 | 8 | T | | | | |
| <i>Poa macrantha</i> Vas. | 22 | 15 | 19 | 5 | 1 | | | |
| <i>Lypinus littoralis</i> Dougl. | 2 | 5 | 12 | 18 | T | | | |
| <i>Polygonum paronychia</i> C. & S | | 1 | T | 3 | | | | |
| <i>Aira praecox</i> L. | | | | 12 | | | | |
| <i>Cerastium holosteoides</i> Fries | | | | 6 | | | | |
| <i>Festuca rubra</i> L. | | | | 6 | | | | |
| <i>Poa confinis</i> Vas. | | | | 4 | | | | |
| <i>Hypochaeris radicata</i> L. | | | | 6 | | | | |
| <i>Holcus lunatus</i> L. | | | | 2 | | | | |
| <i>Rumex acetosella</i> L. | | | | 1 | | | | |
| <i>Achillea millefolium</i> L. | | | 2 | 7 | T | | | |
| <i>Anaphalis margaritacea</i> (L.) B. & H. | | | 1 | T | 8 | | | |
| <i>Ammophila arenaria</i> (L.) Link | | | | 5 | 27 | | | |
| <i>Fragaria chilensis</i> (L.) Duch. | | | | 10 | 5 | | | |



| Species | Communities | | | | | | | | | | | | | | | |
|--|-------------|----|----|----|-----|----------------|----|----|----|----|----|----|----|-----|------|----|
| | I | | | II | III | IV Segments | | | V | | | VI | | VII | VIII | IX |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| <i>Pinus contorta</i> Loud. ^b | | | | | 2 | 9 | 16 | 14 | 13 | | | | | | | |
| <i>Picea sitchensis</i> (Bong.) Carr. ^b | | | | | 2 | 4 | 3 | 1 | | | | | | | | |
| <i>Arctostaphylos wa-arai</i> (L.) Spreng. | | | | | 4 | 2 | T | 4 | T | T | 2 | 1 | | | | |
| <i>Pteridium aquilinum</i> (L.) Kuhn. var <i>pubescens</i> Underw. | | | | 1 | 15 | 16 | 15 | 8 | 9 | 6 | 4 | 13 | 14 | 8 | 10 | 10 |
| <i>Gaultheria shallon</i> Pursh. | | | | | 27 | 17 | 19 | 13 | 24 | 31 | 29 | 21 | 27 | 35 | 30 | 16 |
| <i>Vaccinium ovatum</i> Pursh. | | | | | 6 | 30 | 26 | 25 | 32 | 36 | 32 | 47 | 30 | 23 | 5 | 3 |
| <i>Arctostaphylos columbiana</i> Piper | | | | | | 3 | 9 | 23 | 5 | 4 | 12 | 5 | | | | |
| <i>Rhododendron macrophyllum</i> G. Don. | | | | | | 2 | 4 | 5 | 15 | 16 | 9 | 5 | 15 | 7 | 2 | |
| <i>Myrica californica</i> C. & S. | | | | | | 1 | 3 | 5 | 1 | 6 | 12 | 5 | 5 | 6 | T | |
| <i>Rubus n. acropetalus</i> C. & S. | | | | | | | | | | | | 2 | T | T | 6 | 3 |
| <i>Polystichum munitum</i> (Kaulf.) Presl. | | | | | | | | | | | | | | | 3 | 13 |
| <i>Struthiopteris spicant</i> (L.) Weis. | | | | | | | | | | | | | | | 1 | 4 |
| <i>Maianthemum bifolium</i> DC. var. <i>kamtschaticum</i> (Gmel.) Jeps. | | | | | | | | | | | | | | | 6 | 14 |
| <i>Vaccinium parvifolium</i> J. E. Sm. | | | | | | | | | | | | | | | | 3 |
| <i>Rubus parviflorus</i> Nutt. | | | | | | | | | | | | | | | | 1 |
| Other vegetation | | | | 12 | 3 | 16 | 5 | 2 | 1 | 1 | | 1 | 9 | | | |
| Bare ground ^c | 37 | 40 | 46 | | | | | | | | | | | 21 | 37 | 33 |

TABLE 4. Relative importance values of tree species in the various segments^a of the ordination

| Species | Communities | | | | | | | | | | | | | X | XI | XII | XIII | | | |
|--|-------------|---|---|----|-----|----------------|---|---|----|----|----|----|----|-------------|-----|-----|------|-----|------|----|
| | I | | | II | III | IV Segments | | | V | | | VI | | | | | | VII | VIII | IX |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | | | | | | | |
| <i>Pinus contorta</i> Loud. | | | | | | | | | 95 | 99 | 95 | 95 | 5 | Pine-spruce | 100 | 72 | 31 | | | |
| <i>Picea sitchensis</i> (Bong.) Carr. | | | | | | | | | | | | | | | | 28 | 69 | | | |
| <i>Tsuga heterophylla</i> (Raf.) Sarg. | | | | | | | | | 5 | 1 | 5 | | | | | | | | | |
| <i>Pseudotsuga menziesii</i> (Mirab.) Franco | | | | | | | | | | | | | | | | | | | | |

^aA segment is generally the average value of three adjacent stands along the gradient.

Pine

Spruce-hemlock

Hemlock

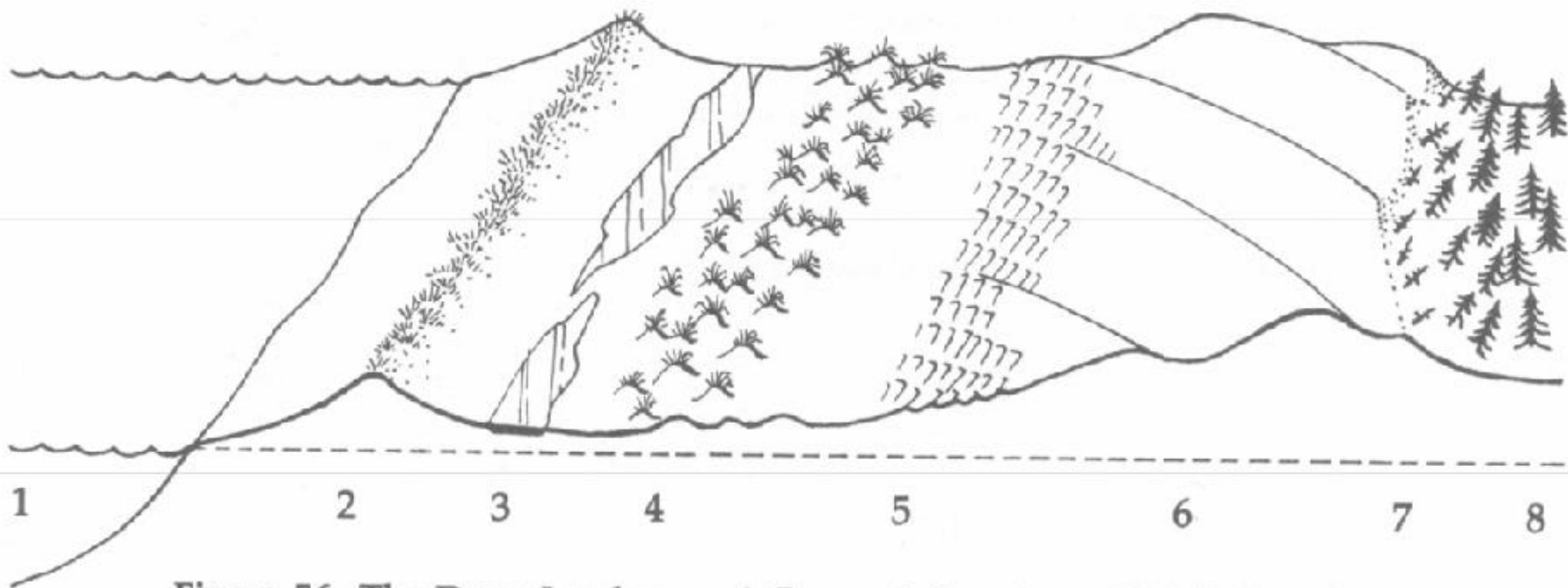


Figure 56. The Dune Landscape. 1 Ocean. 2 Foredune. 3 Deflation plain. 4 Beachgrass hummocks. 5 Transverse ridges. 6 Oblique dunes. 7 Retention ridge. 8 Forest. (Kellerman.)

6
13











Abronia latifolia (native)
 yellow sandverbena
 unknown Co.; locality unknown; 0m; 43.6592° N -124.2057° W
 June 16, 1976
 © 1976 Barbara & Glenn Halliday courtesy of Oregon Flora Project



Abronia latifolia (native)
 yellow sandverbena
 Curry Co.; Langlois
 photo by Julie Reinwand Kierstead May 4, 1983 OFP confirmed
 © 1983 Julie Kierstead Nelson courtesy of Oregon Flora Project



Abronia latifolia (native)
yellow sandverbena
Lane Co.; Heceta Dunes ACEC
photo by Bruce Neil Newhouse June 21, 2005 OFP confirmed
© 2005 Bruce Newhouse courtesy of Oregon Flora Project

19





European beachgrass
(*Ammophila arenaria*)

American beachgrass
(*Ammophila breviligulata*)

21a



21b





Fig. 1. The native dune grasses *Leymus mollis* and *Poa macrantha* mix with forbs, including *Abronia latifolia* (yellow sand verbena) and *Lathyrus littoralis* (beach pea), on the foredune at the Lanphere Dunes Unit, Humboldt Bay National Wildlife Refuge.



Fig. 4.1. Parabola dunes at Humboldt Bay, northern California. View is to the south. The distance from shore to parabola tip exceeds 1000 m. (Photograph by A. Wiedemann, June 1983)

Wiedemann and
Pickart, 2004



Fig. 4.2. The winter transverse dunes of the central Oregon coast. View is to the south, the dunes moving toward the observer (note slip faces). Average crest length is about 1000 m and height above dune base can exceed 50 m (Cooper 1958) (Photograph by Oregon Dept. of Transportation, May 1972)

Wiedemann and
Pickart, 2004



Fig. 4.4. Typical steep profile foredune vegetated with *Ammophila arenaria* prior to restoration. Humboldt Bay, California. (Photograph by A. Pickart)



Fig. 6a. An *Ammophila*-dominated foredune at the Lanphere Dunes in February 1992, prior to restoration (members of the California Conservation Corps are beginning the removal process).

Pickart, 2008



Fig. 6b. The same location in July 2001, five years after restoration work was completed.

Pickart, 2008



Fig. 10. Restored foredune grassland at the Lanphere Dunes Unit, Humboldt Bay National Wildlife Refuge.

Pickart, 2008

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