

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

Date: March 6, 1979

Project Title: Comparative Physiological Ecology of C-3 and C-4 Coastal Halophytes

Project No: G-32-651

Green coral

Project Director: Dr. E. Lloyd Dunn

Sponsor: National Science Foundation, Washington, D. C. 20550

Agreement Period: From 2-1-79 Until 2-28-81*
*Includes 6 month flexibility period

Type Agreement: Grant No. DEB-7905158

Amount: \$31,872 NSF Funds (G-32-651)
1,677 GIT Contribution (G-32-325)
\$33,549 Total

Reports Required: Annual Progress Reports; Final Project Report

Sponsor Contact Person (s):

Technical Matters

Dr. George W. Cox, Director - Ecology Program
Division of Environmental Biology
National Science Foundation
1800 G Street, N.W.
Washington, D.C. 20550
Phone: (202) 632-7324

Contractual Matters

(thru OCA)
Ms. Mary Frances O'Connell
Grants Specialist - Area 4
National Science Foundation
1800 G Street, N.W.
Washington, D. C. 20550
Phone: (202) 632-2858

Defense Priority Rating: n/a

Assigned to: Biology (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director-EES
Accounting Office
Procurement Office
Security Coordinator (OCA)
✓ Reports Coordinator (OCA)

Library, Technical Reports Section
EES Information Office
EES Reports & Procedures
Project File (OCA)
Project Code (GTRI)
Other _____

SPONSORED PROJECT TERMINATION SHEETDate June 2, 1982

Project Title: Comparative Physiological Ecology of C-3 and C-4 Coastal Halophytes

Project No: G-32-651

Project Director: Dr. E. Lloyd Dunn

Sponsor: National Science Foundation

Effective Termination Date: 2/28/81Clearance of Accounting Charges: 2/28/81

Grant/Contract Closeout Actions Remaining:

- ☐ Final Invoice and Closing Documents
- ☒ Final Fiscal Report FCTR
- ☒ Final Report of Inventions (only if positive)
- ☐ Govt. Property Inventory & Related Certificate
- ☐ Classified Material Certificate
- ☐ Other _____

Assigned to: Applied Biology (School/~~Laboratory~~)COPIES TO:

Administrative Coordinator
Research Property Management
Accounting
Procurement/EES Supply Services

Research Security Services
~~Reports Coordinator (OCA)~~
Legal Services (OCA)
Library

EES Public Relations (2)
Computer Input
Project File
Other _____

PLEASE READ INSTRUCTIONS ON REVERSE BEFORE COMPLETING

PART I—PROJECT IDENTIFICATION INFORMATION

1. Institution and Address Georgia Institute of Technology Atlanta, Georgia 30332	2. NSF Program Ecology	3. NSF Award Number DEB 7905158
	4. Award Period From 02/01/79 To 02/28/81	5. Cumulative Award Amount \$31,872

6. Project Title
Comparative Physiological Ecology of C-3 and C-4 Coastal Halophytes

PART II—SUMMARY OF COMPLETED PROJECT (FOR PUBLIC USE)

The primary objectives of this project were to compare the ecophysiological responses of marsh species with C-3 and C-4 photosynthetic pathways and to determine the relationships between plants with these photosynthetic pathways and the major environmental stresses affecting photosynthesis and primary productivity along natural environmental gradients in coastal marshes.

Measurements of photosynthesis and respiration as CO₂ exchange and transpiration as water vapor exchange were made in situ on intact plants growing under natural marsh conditions as well as on plants in intact core samples recently removed from the marsh and on plants grown under artificial culture conditions in the greenhouse. Interstitial salinity, NH₄ concentration and mineralization rate, redox potential and sulfide concentration were measured seasonally to correlate with measured physiological processes.

The C-4 species Spartina alterniflora and S. cynosuroides showed higher rates of net photosynthesis and higher water-use efficiencies of photosynthesis at high summer temperatures and greater reductions in photosynthesis in winter than did the C-3 species, Juncus roemerianus, Salicornia virginica, Borrchia frutescens and Batis maritima. The C-3 species exhibited year-round net photosynthesis and had exceptionally high rates of water loss even at high salinity. There were greater ecophysiological differences within S. alterniflora along the extremes of the environmental gradients in the marsh than comparisons between C-4 and C-3 species in adjacent parts of the marsh habitat. The major environmental factors in marsh sediments affecting plant physiological activity appear to be interstitial salinity, NH₄ mineralization rate and sulfide concentration.

Results from this project provided the first comparative field measurements of CO₂ uptake and water loss rates of major C-3 and C-4 marsh species along natural environmental gradients in southeastern coastal marshes. These results have been useful to other ecosystem-level studies of carbon flow in the salt marsh ecosystem and have increased our fundamental understanding of plant ecophysiological adaptation in salt marshes.

1. ITEM (Check appropriate blocks)	NONE	ATTACHED	PREVIOUSLY FURNISHED	TO BE FURNISHED SEPARATELY TO PROGRAM	
				Check (✓)	Approx. Date
a. Abstracts of Theses	X				
b. Publication Citations		X			
c. Data on Scientific Collaborators		X			
d. Information on Inventions	X				
e. Technical Description of Project and Results				X	Sept. 1982
f. Other (specify)					
2. Principal Investigator/Project Director Name (Typed) E. Lloyd Dunn	3. Principal Investigator/Project Director Signature			4. Date June 2, 1982	

b. Publication citations

- Giurgevich, J. R., and E. L. Dunn. 1979. Seasonal patterns of CO₂ and water vapor exchange of the tall and short height forms of Spartina alterniflora Loisel. in the Georgia salt marsh. *Oecologia* 43:139-156.
- Antlfinger, A. E., and E. L. Dunn. 1979. Seasonal patterns of CO₂ and water vapor exchange of three salt marsh succulents. *Oecologia* 43:249-260.
- Giurgevich, J. R., and E. L. Dunn. 1981. A comparative analysis of the CO₂ and water vapor exchange responses of two Spartina species from Georgia coastal marshes. *Estuar. Coast. Shelf Sci.* 12:561-568.
- Pomeroy, L. R., W. M. Darley, E. L. Dunn, J. L. Gallagher, E. B. Haines, and D. M. Whitney. 1981. Primary Production. Chap. 3, p. 39-67. In L. R. Pomeroy and R. G. Wiegert (ed.) *Ecosystem and population ecology of a salt marsh*. Ecological Studies, Vol. 38. Springer-Verlag, Berlin.
- Giurgevich, J. R., and E. L. Dunn. 1982. Seasonal patterns of daily net photosynthesis, transpiration and net primary productivity of Juncus roemerianus and Spartina alterniflora in a Georgia salt marsh. *Oecologia* 52:404-410.
- Haines, B. L., and E. L. Dunn. 1982. Coastal salt marshes. Chapter In H. A. Mooney and B. F. Chabot (ed.) *Physiological Ecology of North American Plant Communities*. Chapman & Hall, London (accepted, in revision).
- Hopkinson, C. S., and E. L. Dunn. Rapid sampling of organic matter in flooded soils. (in preparation).
- Dunn, E. L., and S. J. DuBois. Temperature responses, water and nitrogen-use efficiencies of photosynthesis in C₃ and C₄ sand dune species of the Georgia coast. (submitted to *Amer. J. Bot.*, in revision).
- Dunn, E. L., B. L. Haines, and J. R. Giurgevich. Nutrient and salinity effects on photosynthesis of Spartina alterniflora Loisel. grown in solution culture. (submitted to *Bot. Gaz.*, in revision)
- Dunn, E. L., B. L. Haines, J. R. Giurgevich, and J. S. Benson. Simulated tidal effects on the height forms of Spartina alterniflora Loisel. (in preparation)
- Dunn, E. L., J. R. Giurgevich, and B. L. Haines. The influence of salinity on the CO₂ and water vapor exchange capacities of Spartina alterniflora grown in solution culture. (in preparation)
- Dunn, E. L. The relationship between stomatal and calculated mesophyll resistances to CO₂ uptake in C₃ and C₄ species. (in revision)
- Antlfinger, A. E., and E. L. Dunn. Water use and salt balance in three salt marsh succulents. (submitted to *Amer. J. Bot.*)

c. Scientific collaborators:

J. R. Giurgevich, Graduate Student, Research Associate

S. J. DuBois, Graduate Student

Shirley Nishino, Research Technician

Steve Shimmel, Research Assistant

Judith Tandler, Student Research Assistant

Neil Avery, Student Research Assistant

Henry Spratt, Research Assistant

Jonathan Quay, Student Research Assistant